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West Europe Report

SCIENCE AND TECHNOLOGY

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ADVANCED MATERIALS

FRG FIRMS JUMP INTO MARKET FOR AUTO, AIRCRAFT CERAMICS

Munich INDUSTRIEMAGAZIN in German 15 Oct 84 pp 97, 100

[Article: "Engineering Ceramics: On the Lookout for Developments"]

> [Excerpts] The breakthrough into a $1-billion market is not expected to occur until the middle of the nineties. But producers who want to be in business in the future with constructive ceramics for engine construction and machine construction must already be arming themselves with large investments.

Roland Dorschner, chairman of the board of the Hutschenreuther Company in Selb, is quite self-confident: he is firmly determined "to grasp the new opportunities" in one of the most promising but also most demanding and investment-hungry market areas of technical ceramics, namely in "structural" or "engineering" ceramics. The springboard is to be provided by a pilot plant which is now being set up by the porcelain manufacturer in the Upper Franconian city of Naila for 3 million marks.

Dorschner believes that there is still a market niche which his enterprise can still occupy "with controlled risk." This is the area of tailored construction components made of ceramic materials to support high stresses in engine construction, machine construction and plant construction as well as in energy and environment technology. When in 1979 Hutschenreuther entered--through purchase--into engineering ceramics all places in this growth market had already been largely parceled out.

Specialists in the field estimate that at the present time worldwide about $4 billion worth of business is being done with electrical insulation parts, support materials for printed circuits, chip housings, piezoelectric elements (they convert electrical oscillations to mechanical oscillations, such as sound, and conversely), corrosion-resistant parts for chemical processing technology, cutting blades, jet nozzles, bearing rings and seal rings, artificial bones and joints and various other engineering ceramic components. In 1990, in terms of today's prices, $10 billion worth of business is expected.

The growth will take place in that area of electronics which is dominated by the Japanese giant, "Kyocera," and it will also come in the field of engineering ceramics, which is still of modest size today.

The "market niche" which Dorschner is attempting to penetrate is considered to be a $1-billion market. Ceramic materials and tailored ceramic parts are expected to replace metals, particularly steel (alloys) wherever the latter is unable to handle high temperatures, extreme temperature changes, large mechanical stresses or a chemically aggressive environment or wherever such metals must be used in the form of expensive superalloys.

Quality Problems

Anyone who wants to open up this market and finally address it seriously must invest millions--over years--and must exercise patience. Because despite all the successes with prototypes it is still uncertain when the breakthrough will occur along the entire front.

In the opinion of Edgar Lutz, board speaker for Rosenthal Technology AG, the mastery of manufacturing technique--from material preparation through pressing technology and subsequent workup using laser beams--imposes "enormous demands." "To get an entire product line which is clean in the engineering sense 10 million marks amount to nothing." The thirsty route from the preliminary production with its need for tests up to final mass production is a long one. "The automobile industry must first be absolutely sure that we can reliably produce ceramic engine parts with high precision," says Lutz.

At Cummins Engine there seems to have been much progress toward the development of ceramic motors for army trucks and tanks. Out front in the FRG is the Kloeckner-Humboldt-Deutz Company, cooperating with Rosenthal. Ceramic motor parts by Feldmuehle and Rosenthal are to be found in experimental products being test driven by German automobile manufacturers. Fingerle expects that as early as the beginning of 1985 these manufacturers will install individual ceramic components such as port linings and valve guides of exhaust turbosuperchargers and in certain passenger cars in small production quantities.

These innovations have not yet yielded a profit; on the contrary the preliminary efforts required for growth (such as that as the doubling of Rosenthal's engineering ceramics sales between 1982 and 1983) put to the test a company's financial endurance.

The Selection Process

The "Annawerk" Ceramics Plant GmbH in Roedental in Upper Franconia, an enterprise of the Cremer Group, has been a pioneer in engineering ceramics using silicon nitride material (trademark "Ceranox") and has been a front-runner in the German market. Nevertheless, the company ran out of steam when business fell off in "construction ceramics," which is its main division. In April 1983 Feldmuehle took over the "Ceranox" program and the "Ceranox" know-how. The latter company is now in a position to offer the entire palette of oxide ceramics and silicon ceramics.

"For silicon products commercially this is only the beginning," says Feldmuehle company man Fingerle. "We can allow ourselves time to develop it further because we are already making money with oxide ceramics"--for example, in ceramic

cutting tools, in high-precision sealing disks for one-hand spigot mixers in the bath, and artificial hip joints of aluminum oxide which have been developed in Plochingen. In addition, a subsidiary maintained jointly with "Kyocera" is selling in the European market ceramic electronic structural elements produced by the Japanese. Of the 1983 worldwide sales of Feldmuehle amounting to 2.7 billion marks, 220 million was in ceramics.

The sales of Rosenthal Technology yielded 191 million marks--with far greater product variety. Although Europe's biggest in the field of ceramic substrates for printed circuits and in chip housings, the company was not altogether happy with that growth market. Because having achieved its greatness with high-voltage insulators and high-frequency insulators it neglected to build an early strong position in the primary U.S. electronics market.

The "Kyocera" Corporation, founded in 1959, entered the chip gap and thus became the giant in that area, having in 1983 sales of 1.2 billion marks in the area of chip housings alone--which was about two-thirds of the world market--and was thus in a position to dictate quality standards and prices. Altogether the Japanese manufacturer sold technical ceramics in the amount of 2 billion marks--two-thirds of the company's sales--and made a profit of over 350 million marks. With its financial strength, innovative power and highly developed technology "Kyocera" is also a force to be feared in engineering ceramics.

Rosenthal, already hard hit in the electronics field, would not be capable of waging such a two-front war by itself. The required injection of money, several hundred million marks by 1990, is to be provided by the international firm of Hoechst which on 1 January 1985 will become a 75.01-percent shareholder in Rosenthal Technology AG. In addition, it will be bringing in experience with silicon carbide material acquired by Wacker Chemistry, its partial subsidiary, and also experience in laser processing technology acquired by its subsidiary Messer-Griesheim.

Hutschenreuther is undismayed by the Rosenthal case. Klaus Strobel, general plenipotentiary for technology, believes in the possibility of profitable operations in special areas if one possesses "special know-how in materials processing and shaping." "If competitors don't take us seriously in this area then that's their problem."

8008
CSO: 3698/83

ADVANCED MATERIALS

FRG RADIOTELESCOPE MADE OF CARBON FIBER-REINFORCED PLASTIC

Landsberg PRODUKTION in German 30 Aug 84 p 2

[Article: "Carbon Fiber Technology for a Radiotelescope: Plastics for Cosmic Waves"]

[Text] Friedrichshafen (p)--Within the framework of its activities in research and in applications of new materials in aeronautics and astronautics and in adjacent areas of technology the Friedrichshafen Dornier System GmbH has rung up another success.

The subsidiary of the well-known aeronautical and astronautical company has recently received a contract from the Max Planck Society to build the first reflector in the world made of carbon fiber-reinforced plastic (CFK) having a 10-meter diameter for a submillimeter radiotelescope. Using a conventional steel mounting by Krupp the telescope is to be erected in 1986 on Mount Lemmon in Arizona at an altitude of 3,000 meters.

For research in the submillimeter range of cosmic radio waves the reflectors must have extremely high contour accuracies under all environmental conditions. Such degrees of accuracy are not attainable with conventional structural materials such as steel and aluminum.

As early as 1981 Dornier System started in cooperation with the Max Planck Institute for Radio Astronomy in Bonn to investigate the use of CFK for telescope components. Today the company is capable of supplying panels of unique accuracy for the reflector surface.

Manufactured on a basis of highly accurate glass forms, the shape accuracy attained in the approximately 2-meter panels is less than 7 μm RMS as compared with about 50 μm for aluminum. In addition to their contour accuracy, CFK parts are distinguished by their minimal thermal expansion, high rigidity, low weight and long service life.

Dornier has already been using CFK successfully in aircraft construction. At the present time, among other things, wings and control services of CFK are being flight tested in an Alpha jet under public contract. Flaps and other parts made of CFK are already in use on a mass production basis.

8008
CSO: 3698/83

BRIEFS

ARIANE 4 TEST SUCCESSFUL--On 9 November 1984, SEP executed the certification firing of the stage 1 of the future Ariane 4 launcher at its Vernon premises. The propulsion bay included four SEP Viking V motors, and the test which represented 208 seconds of operation was fully successful, ending, as planned with exhaustion of one of the propellants. All four Viking V engines operated to perfection which means that the development program for the European launcher Ariane 4 proceeds normally. By June 1984, the Ariane 4 should be ready to orbit satellites weighing 4 tons, whereas the present Ariane 3 can orbit a payload of no more than 2.6 tons. Roger LESGARDS, President-Chief Executive of SEP declared: "This success proves that SEP is interested in the middle term future. The Ariane 4 will be the answer for the 90s. With the heavy HM 60 cryogenic motor already on the drawing board, we will now start thinking about the year 2000 and the Ariane 5". [Text] [Paris BULLETIN DU GIFAS in English 22 Nov 84 p 3]

CSO: 3698/149

AUTOMOBILE INDUSTRY

NEW, ECONOMICAL, CLEAN ENGINE ON SWEDISH MARKET IN FIVE YEARS

Stockholm DAGENS NYHETER in Swedish 7 Dec 84 p 17

[Text] A new, gasoline-saving and environmentally safer automobile engine, which gives very little discharge of nitric oxides, could be introduced on the Swedish market in about 5 years. But for this to happen the state must become financially involved in the project, which costs 250-300 million kronor.

The National Environment Protection Board believes in the new engine, which has been constructed by the Ranotor development company with support from the National Board for Technical Development. It involves a steam propulsion system, which has a very low discharge of nitric oxides, without special equipment for exhaust gas purification.

"The capability of the engine to emit a [low] nitric oxide discharge is the best that has been presented for any combustion engine system," says the head of the Environment Protection Board, Valfrid Paulsson in a report to the government.

In his judgment the new propulsion system has greater opportunities for practical application and mass production than the Stirling engine, for example.

"With regard to the environmental advantage which the engine can provide, the government is justified in becoming involved in the project," Valfrid Paulsson believes. "It is valuable to be able to produce an alternative to catalytic pollution control with equally favorable or better environmental properties."

Combustion in the new engine takes place in an external combustion chamber. According to the constructor, the engine can more easily be adapted to various kinds of fuel than is the case with today's automobile engines.

According to the company, the engine is also capable of meeting all conceivable future pollution requirements. It is said to become economical, very quiet and to have excellent performance characteristics. Besides being used in cars, the engine can be utilized for example in busses, trucks, boats and aircraft.

Both the company and the Environment Board are aware of the problems of trying to introduce a radically new type of engine. It means extensive retooling for the automobile production, at very high cost.

"Previously, it has proved difficult to undertake such a conversion due to the financial risks of such an effort," Valfrid Paulsson emphasizes. "The new engine cannot enter production without the financial involvement of the state."

The Environment Protection Board is of the opinion that the project is too big for the agency itself to be able to contribute financially to its completion. The agency therefore leaves it to the government to decide whether the state should support the development of the new engine.

11949
CSO: 3698/147

VMF-STORK BARGAINS TO ASSEMBLE, TEST ENGINES FOR NEW FOKKERS

Amsterdam DE TELEGRAAF in Dutch 24 Oct 84 p 24

[Text] Amsterdam, Wednesday --VMF-Stork is in negotiation with Pratt and Whitney Canada over the assembling and testing of aircraft motors, which are intended for the new Fokker offshoot, the Fokker 50. It is expected that the two firms can complete negotiations in about three months.

According to division director M.G. Wisse, negotiations over the VMF have been under way with the Canadian manufacturer of aircraft motors for some time now. The concern is supported by the ministry of economic affairs. "Fokker is not unkindly disposed to our plans," says Wisse. Economic affairs mediates the talks between the various parties. VMF plans fit in with the efforts of the government to make new technologies available to Netherlands industries.

Up to this point the motors have been bought completely built and tested by the manufacturer itself. "How and where the motors are made ready makes no difference to us, as long as they satisfy our demands," says Fokker spokesman Knook. "Of course, we relate better to Dutch industry than to foreign, however. It is splendid that VMF is trying to draw to itself a few job openings in this way."

If the negotiations with Pratt and Whitney are successfully concluded, VMF wants to set up a fully equipped repair workshop. "We then plan to repair ship turbine motors. We are also thinking, for example, of setting up to repair gas turbines from Gasunie, which are similar to aircraft motors," says Wisse.

If the plans are carried out, VMF will be investing about 3 million guilders in workshops. These must be expanded. Furthermore, people will have to be trained in the U.S. Wisse expects that the one and the other will lead to an expansion of job opportunities within the concern, for 10 to 15 people, of whom the first are expected to start in 1986.

The operations will be carried out by Werkspoor Services of Amsterdam. This VMF-affiliate is presently carrying out aviation repairs on a modest scale. It is a question of reparing accessory parts for the Boeing 747s of the KLM [Royal Dutch Airlines], the SAS [Scandinavian Airlines System], the UTA [Air Transport Union] and Swissair. Every year this yields a turnover of some 3 million guilders. To what extent this amount might rise Mr Wisse could not yet say. "We are still busy calculating." At the present time about 300 people work for Werkspoor Services.

8117
CSO: 3698/128

AIRBUS A 320 PROGRESS REPORT FROM AEROSPATIALE

Paris REVUE AEROSPATIALE in English Dec 84/Jan 85 pp 4-5

[Article by Evelyne Boury]

[Text] Although it is a member of the Airbus family, the A320 is nonetheless an entirely new aircraft; and it is the only 3rd-generation 150-seat airliner to have been launched to date. Also new are the manufacturing techniques, the tools and the industrial resources being used. The first flight, scheduled for the spring of 1987, will be met only at the cost of unflagging effort day in day out. All the plants and all the partners involved in the project in Europe have been mobilized for the purpose. In France, at Aerospatiale's facility at Nantes, which is building the wing spar box, a fuselage section and the aft upper portion of another section, there is keen rivalry at all levels.

Five months have elapsed since the first A320 part was machined at Nantes and now manufacture of all the long-lead time elements has begun.

The A320-related workload in this plant is a big one and includes manufacture of Section 21, the wing spar box, the upper aft portion of Section 11-12, the flight deck, the "soft underbelly" (i.e. the fairing under the fuselage), and such components as landing-gear doors, floors, pylons and control bars.

Long-lead items

The primary elements of Section 21 are those with the longest lead times being machined from the solid on numerically controlled machines. Machining began in June on an upper surface cross-brace, the key element of the root rib and currently nearing completion. Also in an advanced stage of manufacture are such major components as the Tee-member which is another crucial part of the root rib.

Meanwhile all the major structural parts of Section 21 of No.1 aircraft (a product of computer-aided design at the Aerospatiale Design Department at Toulouse) have also passed the computer-aided manufacturing stage at Nantes.

At the same time certain elements like the near spar, the rib web, the frame attachments and the rib flanges have completed full numerically controlled machining and are currently undergoing the inspection phase.

In addition, the tooling to produce the subassemblies were expected to be operational at the end of November.

Complex

Meanwhile work is going ahead on the final assembly site, where the first portions of Section 21 are expected next January. According to schedule, Section 21 of No.1 aircraft will be ready for air-lifting to Hamburg in July next year by Super Guppy via Toulouse.

Fuselage Section 11-12 is a complex item, consisting of a number of major structural parts and, above all, of sheet-metal skins whose fabrication involves

such recently developed sophisticated processes as chemical etching. It may be recalled that the roof portion is a stretched item produced at MBB (Hamburg) which is afterwards chemically etched at Aerospatiale's Nantes facility.

Manufacture began last October and the first subassemblies will be ready in mid-December, after which Section 11-12 will be delivered for completion to the Saint Nazaire plant at the end of May 1985.

As for the fuselage belly fairing — sometimes referred to here as the "soft underbelly" — manufacture will begin early next year. This fairing provides a link between the fuselage and the wing. Manufacture is shared between two of the Airbus Industrie partners, with Nantes being in charge of the front section and MBB of the rear section. Because of its curved shape, the "soft underbelly" is made of composite materials (Kevlar/Nomex). And because the manufacture of this fairing involves European cooperation, it implies continual contacts with virtually all the Airbus Industrie partners.

Concerted efforts

Special operational task forces have been set up to monitor the manufacture of the A320. They are made up of technicians belonging to different disciplines in all the production shops. Their role is not only to take stock of progress in manufacture but also to effectively resolve, as a team, any difficulties that may be encountered. These concerted efforts are the key to the success of any product — the more so if the latter is a new Airbus called the A320.

CSO: 3698/149

OPTICAL COMPUTER STUDIES AT UK'S HERIOT-WATT UNIVERSITY

Duesseldorf WIRTSCHAFTSWOCHE in German 2 Nov 84 pp 96, 98

[EXCERPT] Up to the present it has not been possible to incorporate semiconductor lasers into the glass fibers in such a way that, upon being reached by weak incoming light impulses, they emit strong new flashes. But Helmut Pascher and Heinrich Keil of Siemens confirm the fact that work is proceeding in the laboratories to trigger switching procedures directly with light impulses. Beyond that, the Siemens engineers hope to "find optical switches which could replace electromagnetic and electronic switches."

Scientists at the Heriot-Watt University in Edinburgh believe that they are very close to that goal. They are working on the development of optical computers under the direction of Professor Desmond S. Smith. While a lot of work remains to be done, Smith can demonstrate laboratory models of optical connector switches which process data with light impulses in a way which otherwise occurs in electronic elements.

While comparable efforts are underway in U.S. laboratories, e.g., in the Bell Laboratories under the direction of one of Smith's doctoral candidates, the Europeans are apparently ahead in this field. To preserve this state of affairs, the European Community has contributed $1.45 million in research grants.

The basic principle of the optical switch is a bi-stable effect in crystals which, depending on the intensity of the controlling ray of light, are more or less translucent and remain in the state thus assumed, whereby they indicate the values "zero" or "one" of the universal binary number system of all computers. They are therefore able to store data and, in combination with others, form gate circuits and finally arithmetic units for data processing.

In addition, Smith has developed a light intensifier which he calls a transphasor in reference to the transistor. It is capable of strengthening light signals which have been weakened by passing through several optical switches. The next project calls for the construction of an optical demonstration computer whose performance, while not yet quite equal to that of common pocket calculators, is to prove its functional feasibility. Asked for his time schedule, Smith is confident: "The computer model will be finished within 2 years." Others participating in the program are however a bit more

skeptical. However, in view of the increasing flood of information available and the physical limits imposed upon further chip miniaturization, the optical computer holds some fascinating prospects.

As a matter of principle, an optical switch can react considerably faster than any semiconductor. The theoretical limit lies near a thousandfold increase. To begin with, there should be gladness if the optical computer actually surpasses the performance of its electronic siblings, which will soon reach the limit of their further improvement. But once in use, it will offer a chance for enormous progress in the real-time processing of complex data--not only because of the great speed of optical switches, but also because they are capable of sending several signals simultaneously through the same element and thus avoid the infamous bottleneck of electronic computers.

The question remains what materials have the best properties for optical switches. Until now, Desmond Smith has been using Indium-Antimonide, which however requires deep cooling to minus 196 degrees C. What is needed are materials which can be used at room temperature. The Fraunhofer Institute for Physical Measurement Technology in Freiburg is studying lead-chalcogenides for that purpose, on which it has already collected comprehensive data.

The optical computer has already been tagged with a nickname: from the scientific name for the smallest particles of light, it is being called the "photon brain."

9273
CSO: 3698/121

DUTCH INSTITUTES DO RESEARCH IN TACTILE, VISUAL ROBOT SENSORS

The Hague TNO PROJECT in Dutch Sep 84 pp 340-342

[Article by G.A. Schwippert and G.K. Steenvoorden: "Research into Better Sensors Should Make Robots more Flexible"]

> [Excerpts] Even robots of the so-called "second generation" -- which are equipped with microprocessors and readers (sensors) -- are not flexible enough. They still react with insufficient speed to changes during the production process. A change, for example, in the roughness of the material to be processed, or a conveyor belt which starts moving a little faster.
>
> Engineers G.A. Schwippert and G.K. Steenvoorden work respectively for the Delft Center for Microelectronics (CME-Delft) and the Technical Physical Service TNO-TH (TPD). Both Delft authors write, among other things, about the so-called "key project " Industrial Sensors. Scientific research should lead to better sensors which are indispensable to an intelligent automation of industrial production.

Robotvision

The value of being able to perceive objects and conditions optically has been recognized for a long time. Consequently, a great deal of research has already been done in that area, and a great deal of research is being done. A Center for Image Processing has been set up in Delft where the Technical Physical Service TNO-TH (TPD), the Technical Physics division and the Electrotechnology division of the Delft Technical College cooperate in the broad area of image processing.

Generally speaking, the sensor being used is a television camera or a so-called "solid state camera" (a camera which operates with a semiconductor as reading element). The images are divided into picture dots (pixels) and the gray scale value (an intensity value between light and dark) of a dot is determined. If more continuous information is desired, then a PSD [Position Sensitive Device], a silicon sensor based on the lateral photodiode effect (the effect whereby the photocurrent is divided horizontally over the sensor) can be used.

The images read contain a great deal of information. Therefore, to draw the correct conclusion a significant reduction in the quantity of the data is necessary. This must be combined with a strong microprocessor.

Problems arise when the desired information is supposed to become available during production, and thus quickly.

To achieve a quick working vision system with good potential for use at a reasonable price is a challenge to those who have ventured in this area.

One of the activities of the Delft Microelectronics Center is to research the characteristics and implementation possibilities of the PSD. This is done in cooperation with the Electrotechnical Materials vocational group of Professor S. Middelhoek of TH Delft.

A serious limitation of the above mentioned vision systems is that the process is virtually always limited to two-dimensional images. To be able to interpret three-dimensional images is a task which will demand a great deal of attention in the coming years.

On the one hand, there is an optical problem here: how do you reliably and accurately transpose the third dimension into an optical signal? On the other hand, the data flow increases and the demands which will be made on the microprocessors become extraordinary. Solutions are sought in special electronic connections and in "artificial intelligence" [AI].

Another focus of attention concerns color and contour perception of objects. This aspect is of great importance with regard to problems of automation and quality control.

Tactile and Force Sensors

The robot's working arm is one of the parts which is given a great deal of attention by researchers. By giving the fingers of the working arm a kind of "feeling" the robot is capable of perceiving the form of parts and determining in what position the part is held by the working arm. A common method is to measure force applied on the fingers by means of horizontal strips.

New developments make use of piezoelectric foil. The Synthetic Materials and Rubber Institute TNO (KRI-TNO), together with the Technical Physics department of the Delft Technical College, is studying a grip sensor based on the piezoelectric PVDF (polyvinylideen fluoride). The sensor will consist approximately of 16x16 elements of 1 square millimeter each.

Ultrasound and Speech

To determine the distance from the working arm to an object, ultrasound, transmitted and measured by transducers (turning electrical into acoustical energy and vice versa), can also be used. A short impulse of 100 kilohertz, for example, is transmitted. From the length of time and the form of the reflected signal the sensor can determine the distance and possibly the form of the object.

Research focusses on the development of so-called broad band transducers, respectively an array of transducers, and an advanced signal process with the help of microprocessors. The TPD and the Delft Microelectronics Center are conducting so-called key programs in the area of acoustical sensors.

Detection of Gasses

The use op odor sensors is not very highly developed. Partly because reliable sensors in this area are virtually impossible to obtain. And because it is often a question of the selective detection of minimal amounts of gas or fumes.

Areas of implementation of odor sensors include the surveillance of the composition of exhaust gas, from which both environmental, technical and economic advantages could be derived.

The Delft Microelectronics Center is active in this area with the development of an ethane sensor to determine the ripeness of fruit automatically (in cooperation with the Main Social Technology Group TNO) and with the development of gas sensors based on so-called "surface acoustic wave-techniques" together with TH Delft.

Key Project

The three Dutch centers for microelectronics (in Eindhoven, Enschede and Delft) have made mutual agreements about the distribution of the so-called "key projects." Those are projects which should produce applicable results (as a product or a system) for Dutch industry in the somewhat longer term, but which are not yet commercially feasible.

The Delft Center initiates and coordinates research in the area of industrial sensors. That is not surprising. There is a broad basic knowledge of sensors, specifically sensors based on silicon technology, at TH Delft. This basic knowledge, combined with applied scientific research in the area of readers for the various TNO institutes, forms the point of departure for the Industrial Sensors "key projects" of CME-Delft.

Meanwhile, scientific research within the framework of this project is in progres. The results of this research will certainly contribute to the future availability of industrial sensors which will make possible a more intelligent automation of production in Dutch enterprises.

Biographical Data

G.A. Schwippert (48 years old) studied electrotechnology at the Delft Technical College. He has been working for TNO since 1964, first as coworker in what is now the Main Social Technology Group TNO (MT-TNO). More than 2 years ago, in early 1982, he became head of the Delft Microelectronics Center (CME-Delft). This center, one of three in our country, is an independent division of the Main Technical-Social Services Group TNO (TWD-TNO), but is also connected with the national Foundation of Microelectronics Centers (SCME).

G.K. Steenvoorden (40 years old) also studied at TH Delft. He is on the scientific staff of the Technical Physical Service TNO-TH in the same city. At TPD [Technical Physical Service] engineer Steenvoorden is in charge of managing the Electronics department. He is also scientific coordinator of the Industrial Sensors "key project" of CME-Delft and coordinator of the Sensors and Actuators "stimulation program" of the Foundation for Technical Sciences.

8463
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SCANIA, ASEA OF SWEDEN USE ROBOTS FOR ALL PRODUCTION PHASES

Bern TECHNISCHE RUNDSCHAU in German 18 Sep 84, pp 25,27,29

[Article by Peter R. Muehlemann: "Sweden, the Robot Superpower"]

[Text] No country in the world can compare with Sweden in robot intensity. As early as 1981, there were about 30 industrial robots for every 10,000 inhabitants. The same figure in Japan was 13, and for the U.S. only four robots. Germany also came along to some extent with five. But the rest of Europe is hopelessly beaten. France and England have, for example, only 1.2. And the Swedes not only play an important role in the use of robots, they also have in ASEA one of the largest suppliers, and in Spine they have a newcomer that is offering a new system (elephant trunk principle).

In Sweden, industrial robots have become normal equipment and have no bitter aftertaste as job killers. Here one lives with these technical furnishings as one lives with other machines. The industrial robot is nothing more than a technical instrument that lightens the human workload and with which one can, with the flexibility required today, increase productivity.

But in Sweden the industrial robot is not only an important factor in its application; the production of robots also has an important place. The following values may serve as a measure:

- Worldwide the standard production of industrial robots makes up three percent of the standard machine tool production. In Sweden this value already lies at about 40 percent.

- Worldwide Sweden produces about nine percent of the industrial robots, while the comparable value for machine tools is only about one percent.

In recent times institutes have arisen in Sweden that deal with the technical application of robots and also of necessity with the pertinent peripheral areas. An example of this, as we will see later, is The Swedish Institute for Production Engineering Research (IVF) in Stockholm, which has dedicated itself to the study of the flexible assembly automation with robots.

The large robot producer, Asea, has also contributed significantly to the spread of robots in Sweden. In its own factory, it has many possibilities of use, and this probably contributes to the present high state of the Asea robots, for not only the research section is fighting here at the front, but, as we will see, also the users in their own house are always ready to immediately put the latest results to use.

In Sweden as well, the main users of robots are the "giants," that is, those who can "afford" to make an early purchase of such machines and to test them. The automobile and truck industry stands here, as in other countries, at the head of the list.

Manifold Use of Robots by Scania

In Scania, industrial robots are becoming more and more the normal production equipment in the most varied areas of the operation. Use in technical production began as early as 1976, when the first robot was introduced in a group of machines for the boring and clearing of switch bushings (Figure 1). Today Scania uses 85 industrial robots in production, 50 of them in Sodertalje and 35 other factories in Falun, Lulea, Oskarshamn, and Goteborg. Fifty-four machines are used for the loading and unloading of equipment, 22 run in the spraying or welding functions, and nine are already working in the latest are of robot use, in the assembly of gasoline motors.

Transmission Production as Large Application Area

The largest section of industrial robots in the Sodertalje factory is used in the production of gear wheels. The reason of this concentration is that many gear wheels are identical in type and size and can also be produced in large numbers up to 200,000 units a year. Moreover, many modern transmission parts have complicated geometrical forms. This means that they run through several machines, often with very short work times, in the manufacturing process. This large amount of robot work was introduced by Scania above all to eliminate the monotonous work and the extensive manual effort in this type of production.

Figure 2 shows an Asea robot applied to unit handling in a machine group for the production of main shaft gear wheels. The production adjustment from one gear wheel variant to another goes very quickly with the robot, because besides a program change, at most only a handle change is necessary.

Handling and Finishing in the Diesel Motor Factory

In Scania one also finds robot operated tools in the production of diesel motors. Thus for example the clearing machine that processes the connecting rods for the six cylinder diesel motors is handled and unloaded by a robot (Figure 3). This machine was previously handled manually; the change is therefore relatively new. But it became necessary because the working conditions for the operator became intolerable with the large amounts of cutting fluid. In addition, the purely manual handling of the units was difficult, for the connecting rods weigh between 4.5 and 6 kilograms. The robot used

today for servicing the clearing machine is six axis and has grippers for double functions in order to be able to carry out the insertion and withdrawal of the connecting rods and connecting rod covers in the various tensioners and positions.

In the manufacture of diesel motors, robots are not only used for the operation, but also for deburring crankshafts. This process deals with the reworking of crankshaft sides that have burrs or sharp edges after milling that have to be removed before further processing. Manual deburring is a very difficult and dangerous job, because sharp splinters come loose during the grinding. The operator must therefore wear protective clothing.

The robots used here operate with a rotary file. Five of the six available axis are used for tool movement. The sixth axis guides the rotation of the production part.

The Most Modern Assembly for Gasoline Motors

Several robots are also used in the production of gasoline motors for Saab cars, for example a two-armed apparatus for putting on and taking off of camshaft covers. Since every motor has five such covers, large numbers are produced here. Also, since the working time is very short, one felt that here too there was reason for automation. More robots are used in this motor production in a boring machine for main storage covers.

In gasoline motor production the main thrust of the robots is clearly in the assembly. For example, four machines work on the assembly of the main body. Two work at the same station (Figure 4), where they put in a total of 23 screws for the intermediate plate and the dashboard cover. In an assembly section before this, a further machine is used (Figure 5) to mount ten cylinder head screws and finally with an automatic computer driven screwdriver to screw them in with the correct torque.

The fourth machine mounts with a three-finger gripper (Figure 6) first the flywheel to the crankshaft end and shifts then to a two spindle screwdriver (Figure 7) with which the screws are mounted and screwed in.

For the processing and mounting of cylinder heads there is a special workroom in which a total of five industrial robots are placed, three in processing and two in mounting. In the processing line for the 16-valve cylinder head, two machines work groups of borers for the detailed work on valve seats and guides. A third machine deburrs the edges of the upper and lower cylinder head surfaces as well as the edges of the combustion chamber with the help of a rotating file.

With the first robot (Figure 8) on the assembly line for cylinder heads the valve spring package is mounted. Spring discs, valve plates, and spring plates are lead by swing or lift disc transporters to a spring package assembly station where these parts are put together and stacked in packages of 8 or 16 units depending on the type of motor being assembled. The spring packages are placed in a magazine that fits the robot gripper. From there one package after another is assembled.

The next station is something unique, and Scania is up to now the only firm in the whole world to carry out such an assembly operation with an industrial robot. At this station there is an Asea industrial robot IRB60 (Figure 9) that seems greatly oversized for the prescribed task, namely to mount a valve cone that is about 10 grams in weight. But this is not true, as the description of the complicated assembly process will soon show.

For the securing of every valve, two valve cone halves are used that are led by a swing transporter in the correct position to a magazine. There the robot gets the two cone halves into its magazine. On the gripper there is also a tool for pressing the valve springs together. Here we also see the reason for the size of the robot, for the pressing together of these springs, which enables the entry of the cone halves at the right place, a force of 75 kilopounds is necessary.

Great Humanization in the Area of Spray Enameling

Robots have long been used for spray enameling, for the spraying jobs are considered to be the most inhuman. Scania tried therefore as early as the middle of the 1970's to redo the spraying and to automate it. But there was no satisfactory solution until after 1979, that is, only after this time could the desired enameling speeds in such a variety of bodies be achieved. Today for the spray enameling of the chassis two robots in a line in a spray cabin are used.

To spray all the various chassis variants of the Scania truck program, the two robots must work according to 140 different programs. A buffer storage and a microcomputer are used; for the latter the programs are stored on IBM standard diskettes.

The robots (Figure 10 shows a machine in the chassis spray cabin) cannot accomplish all tasks 100 percent, for there are always places that are inaccessible to the machines. In this case spraying is done by hand at the end of the line. This applies both to the chassis spray line and to the line on which motors and transmissions are sprayed. On the average, the robots can accomplish about 85 percent of the spraying, and the human being is then only needed for the remaining 15 percent.

In the same room in which the bodies are assembled, there is also the line on which motors and transmissions are joined together. Here too, directly afterwards, the spraying is automatically done in a cabin. Two robots do the job, each one taking a side of the unit. These two machines work according to 12 different programs that are selected by the operator at the entry to the cabin. Here two different paint types are used, a cover paint and a heat-resistant aluminum paint for the turbocharger and the exhaust pipe. The robots are therefore equipped with double spray cans. To get an exact agreement between the robot movement and the forward movement of the motor in the hanging transporter, there is also in this machine a speed measurer in this machine as well and a built-in synchronizing system.

Scania with a High "Robot Average"

Today, the Scania firm has robots in use in practically all its branches. In Falun, for example, where front and rear axles as well as brake parts and differential casings are produced, they are used to run the machines and for spray enameling. In the Luela factory they are also used to run machines, but additionally, for welding. Here frame carriers, shock absorbers, and rear axle bridges are manufactured. In Oskarshamn they are again used for welding and spraying, this time in the drive manufacture of trucks. Fifteen robots are in operation in the Goteborg factory where transmission parts for cars and also motor parts for trucks and buses are produced. Here all the machines for loading and unloading machines are used.

With its 85 robots in use, Scania has attained a value of 110 persons per robot, if only the factory personnel and not the management is counted. The Japanese automobile industry may serve here as a comparison; in it an average value of 560 persons per robot is noted.

Pioneering Use of Robots in Asea

The large firm Asea fulfills a double function as far as robots are concerned. On the one hand the robot section deals with research, development, training, and production, and on the other hand there are the various Asea sections that are robot users. Here a potential is present that must not be underestimated and that is also exploited by the Asea robot people. There are plenty of areas of use, both in pure operation as well as in processing and assembling.

A Flexible Production System with Robots in the Center

In Asea as well by far most of the robots are used for operational tasks in flexible production systems. Figure 11 shows a beautiful example, where aluminum cool plates for thyristors are made. In the center of this system, on which about 60 different cool plate variants are produced, stands an IRB60/2 with six degrees of freedom. The treatment and transportation of work units takes place here by way of two chain transporters, on each of which are five pallets. This corresponds approximately to a production of 48 hours.

This system has no work unit recognition. True to the principle, "Whatever must function automatically is done in the simplest manner possible; even so it will be complicated enough," the machine operator here gives the unit number and the number of pallets loaded with the work unit. Therefore a maximum of five different work unit types can be loaded for 48 hours. With the mass production sizes available, however, this limit is hardly ever reached.

On the basis of the information on the type of work unit and the number, the robot is guided. This goes so far that it even changes the tensioners in the processing machine if this is necessary for the new work units.

The decrease or increase of work units in the pallets is sensor guided, where the raster is programmed, but where the various step heights as well as the paper or carton intermediate layers have to be sensed. The robot also changes the empty pallets automatically from the sender to the departer.

Robots with "Eyes" as Diligent Deburrers

Asea has installed one of the most astonishing robot uses in the area of deburring of spray casting parts (Figure 12), and this is not just a demonstrator, but a fully operating machine. Twelve different gear boxes are deburred.

The boxes come in columns of two or three on a photocell-guided transport to the deburring machine. The transport strip is loaded by hand and holds work units for three to four hours.

With such a "Robot Vision" system the work units are identified at the beginning of the deburring, and in connection with this identification the robot is guided, that is, it takes the gripper that fits the work unit and works according to an operational program that is also determined according to the particular work unit. Work is done here with fixed tools, four boring stations with various diameters and lengths, two disc grinder stations, a filing unit, and a blowoff station past which the work unit is led in series.

Assembly from Above and Below

The Asea people also have an in-house display model of assembly technique, and here, too, in production and not just for display. Electric switches of various sizes are mounted. Each switch consists of 12 individual parts. Six of these parts have a form that is more long than wide and are assembled by the robot. The six other elements are mounting parts and fibers or other small parts and are mounted by the peripheral equipment.

In this installation there are, as Figure 13 shows, two robots in use that are fixed in the same verticle axis, one on the floor and one on the ceiling. Each robot has a manifold gripper for the six different switch parts. The two machines work out-of-phase, that is, a robot assembles a switch with the six parts in its gripper, while the other gets six new parts from the magazines in order to mount the next switch. In this way the total pheripheral equipment for two robots can be used.

The adjustment from one type of switch to the other takes at most five minutes, and the installation is supervised by one single service operator, who also sees to it that the supply of parts in the magazines does not give out. The installation puts a switch together every 25 seconds. For the robots, therefore, there is a cycle time of 50 seconds.

Research Institutes are Working on Flexible Assembly Installations

Assembly automation with great flexibility is one of the important problems in production technology strived for today. The reasons for the demands for flexibility are on the one hand that the costs of assembly units constantly are increasing and on the other hand that the life of the assembled products is getting shorter and shorter and the number of types is continually increasing. In Sweden, too, therefore, research institutes have begun working on these tasks. The Swedish Institute for Production Engineering Research (IVF) is one of these. Here there is an experimental assembly unit (Figure 14) in which two IBM and two Asea robots are integrated. The IBM robots work according to the Scara, the horizontal arm bending principle.

The goal of this unit is to be able to assemble a number of products and variants of these products in small lots (1h). In the construction theory it is clear that the unit is not conceived for any particular product or family of products. At present a family of compressed air motors and also an oil pump can be assembled by it.

Various systems are introduced as early as in the equipping phase of the robot. One Asea robot, for example, has grippers that are arranged on a revolving head, while the other changes gripper fingers. One of the IBM robots has the same system. The second IBM unit, on the other hand, has changeable grippers that are attached electromagnetically. Moreover, the robots can also connect special tools at stations that provide, for example, a tool for pressing rotors into the ball-bearing races of compressor motors, or a screw unit on an Asea robot for assembling oil pumps.

The unit already has at present an automatic self-supervision and error indicator. For example, inductive sensors are installed for this purpose. They are to supervise the gripper changes and to determine whether the gripper has taken up a part or not. A photo sensor is used to supervise an assembly operation. This supervisory and error-detecting system is to be considerably further developed. Here the emphasis will be placed on flexible, visual sensors that are to supervise the positioning, orientation, assembly, and quality of the work.

New Solutions with the Elephant's Trunk

The new Spine robot in Figure 15 functions like an elephant's trunk, or, as the builders prefer, like a spinal column. This is made possible by a new construction principle in which a series of oval bodies are attached to one another and held together by four wires.

The new robot has seven degrees of freedom (machines up to now work with five or six axes) and a carrying capacity of 10 kg. A turning of the middle section of the arm serves as a seventh axis. The working room is approximately hollow-ball shaped with an outer sphere diameter of 4.8 meters and an inner diameter of about 1.2 meters. This gives a working space of almost 50 cubic meters.

According to the manufacturer, one can expect from this robot type a wide range of applications in areas such as paint spraying, leakproofing, or pasting operations, assembly and operating technology, as well as in arc welding. The machine that is now offered, however, is specialized for the spraying of inner areas and is also being used by Volvo, which took part in the development, in several different forms. The new arm movement here allows for adhesive processes in the inner areas that up to now could not be automated.

PHOTO CAPTIONS

1. p 25. Figure 1. The first industrial robot installed by Scania serviced boring and broaching machines for switch bushings. (Figures 1 to 10: Scania)

2. p 25. Figure 2. Asea robots as operational unit in a machine group for the production of gears.

3. p 25. Figure 3. Processing of connecting rods in a broaching machine with a large robot.

4. p 25. Figure 4. Two Asea-IRB60's in the assembly and fixing of screws in the assembly of gasoline motors.

5. p 25. Figure 5. Assembly of 10 cylinder head screws in a gasoline motor by an IRB-6 from Asea.

6. p 27. Figure 6. This robot picks up the flywheel with a three-finger gripper from a pallet and puts it on the motor.

7. p 25. Figure 7. The robot in Figure 6 then changes the tool and screws in the flywheel screws with a double-spindled screwdriver.

8. p 27. Figure 8. This machine mounts the valve spring packages on the cylinder heads.

9. p 27. Figure 9. Here Scania is the first auto maker in the world to mount valve cones with an industrial robot.

10. p 27. Figure 10. Trallfa robot spray enameling chassis for trucks; 140 different variants are sprayed.

11. p 27. Figure 11. Asea robots as operational machines in a flexible production cell for the manufacture of 60 different cooling elements. The robot changes work units and tensioners. The system can operate automatically for 48 hours. (Picture: Asea)

12. p 27. Figure 12. Robot in a deburring installation for 12 different plastic spray-cast parts. The parts are led on a band and identified by a television system (Robot Vision). After the identification, the robot takes the right gripper and leads the work unit according to the program past the deburring instruments. (Picture: Asea)

13. p 29. Figure 13. Two robots arranged in the same verticle axis assemble electric switches with a cycle time of 25 seconds. Each robot alternately assembles a switch. (Picture: Asea)

14. p 29. Figure 14. Universal, flexible assembly installation, here conceived for the assembly of two different compressed air motors and an oil pump. (Picture: IVF)

15. p 29. Figure 15. Spine spray robot with a new arm, which, thanks to its seven degrees of freedom, is specially suited to the coating of inner areas. (Picture: Spine)

9124
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ASEA TO OPEN ROBOT FACTORY IN JAPAN NEXT YEAR

Stockholm DAGENS NYHETER in Swedish 23 Nov 84 p 10

[Article by Johan Markvall: "Asea Robots to Be Built in Japan"]

[Text] Asea's industrial robot division, Asea Robotics, is now expanding its activity in Japan. A new factory is to be ready next year for the assembly of industrial robots. It will have a capacity of 1,000 robots a year.

"According to our plans, we will reach full capacity some time during 1990," Nick Rizvi, information chief at Asea Robotics, told DAGENS NYHETER. "In 2 or 3 years we will also manufacture 60-70 percent of the parts for the robots in Japan. Presently, most of the parts come from Sweden."

Asea Robotics sold about 200 robots in Japan in 1983, but expects to sell at least twice that many this year. Nick Rizvi said that the turnover for the division this year will increase by about 200 million kronor, from 600 million to approximately 800 million kronor.

"We hope that the new plant will enable us to increase our turnover by a total of about 40-50 percent annually," Nick Rizvi said. "The entire market is growing by an average of 25 percent a year, but we are hoping for more."

Traditionally, the Japanese automobile industry has been Asea's biggest customers in the robot market. The automobile industry as a whole is very robot-intensive. But Nick Rizvi says that the aircraft industry and electronics industry are also to a greater extent using industrial robots in their production. Manufacturers of household equipment are also increasingly beginning to use robots.

"It is a rapidly growing market," he says. "Japan is also regarded as a 'robot country.' It is one of the reasons we are investing in that market."

11949
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SIEMENS LAUNCHES 'MEGA PROJECT' WITH PHILIPS

Hamburg DER SPIEGEL in German 29 Oct 84 pp 115, 117, 119

[Text] Siemens and Philips are trying to overtake the Americans and Japanese in microelectronics with their super-chips.

The managers of Munich's Siemens electronic conglomerate have for several years been annoyed at the statement that their enterprise had grown sleepy. One keeps on hearing that the biggest private employer of the FRG is more interested in investing its money in blue chip securities rather than in the technology of the future. At its annual meetings, the board of directors was forever being kidded about being "a bank with an electronic subsidiary."

Now the people from the "electronic subsidiary" have managed to get a surprisingly large sum of money out of the money managers. Until 1989, Siemens plans to spend DM 2.2 billion in order "to become a member of the world's leadership" in the development of super-chips.

"Project Mega," as it is called by its in-house code name, is an ambitious tour de force. After more than a decade of drifting in the wake of the Americans and Japanese, the Germans will try to compete for leadership in microelectronics. According to Siemens boss Karlheinz Kaske, the investment is proof "that we really mean it."

Says Uwe Thomas, head of microelectronics in Bonn's Ministry for Research and Technology: "It is a crazy competition." At roughly 4-year intervals, the industry increases the capacity of the fingernail-size silicon chips, used in computer memories, by a factor of four. The one who is first in delivering a new chip generation, makes fat profits. In that race, Siemens has to date always cut a sad figure. It took until 1977 for Siemens to offer a so-called 16 K RAM, a chip capable of storing 16,000 information units (bits). By then, the business had long since evaporated. With the next four-fold leap to the 64 K chip, Siemens came in late also.

The boom in personal computers, most of which have a 64 K capacity, still provided Munich's slow developers with a modest market share of 3 percent for this product.

With the forthcoming business in 256 K memories, the German electronics conglomerate wants to do better. If mass production in Villach, Austria, at the end of this year turns out well, Siemens will be limping in 1 year behind the Japanese, only a few months behind the U.S. manufacturers.

Hermann R. Franz, Siemens vice-president in charge of components, hopes that the Mega Project "will further significantly reduce the time lag behind the leading U.S. and Japanese manufacturers." The next generation of chips, and the one following after that, are to be produced in a new factory in Regensburg, for which Franz laid the cornerstone in the middle of October.

Mass production of 1-megabit memories is planned to start in 1987: after 1989 4-megabit chips are to be produced there also. These tiny flakes pack data in a hardly imaginable density into their circuits. The 1-megabit chip can store the equivalent of about 70 single-space typed pages.

Whether or not Siemens will really be able to climb to the top in the mega class remains to be seen. As long ago as last March a Japanese consortium from Hitachi, NEC and the NTT telephone company presented the first sample of a 1-megabit memory. IBM has also developed such a super-chip in its laboratories. Siemens is said to be testing a prototype production line in its computer center in Munich-Neuperlach ("Datasibirsk").

The deciding factor with the 1-megabit chip is not success in the laboratory, but rather the capability for faultless mass production. Even a piece of dust, invisible to the naked eye, in the production process can ruin the structures on the silicon chip measuring one-thousandth of one millimeter. In the Regensburg assembly line only 40 dust particles measuring a maximum of half of one-thousandth millimeter per cubic meter of air will be tolerated--which, according to Siemens, is "a cleanliness level not yet feasible elsewhere."

However, with the 4-megabit chip observance of the Bavarian cleanliness commandement will no longer suffice. The circuits here become so tiny--less than one-thousandth of one millimeter--that the manufacturers are coming to the physical limits of available production techniques.

Research and development activities for the Mega Project were conducted by the Munich people as a joint venture with the Netherlands' Philips electronic conglomerate. With their German VALVO subsidiary, the Netherlanders are by far the biggest European chip manufacturers. Siemens is in second place.

The research ministers of both countries have supported the risk taking of the two big enterprises with millions in three figures. Bonn is contributing DM 300 million to the Mega Project, the Netherlanders are supporting Philips to the tune of about DM 170 million.

The officials in the Bonn research ministry had considerable doubts as to the European firms' capability of participating in the international microelectronics competition. It would of course be conceivable that they might restrict themselves to the so-called systems business, i.e., buy the chips and build them into their systems.

But in that case, says Thomas, the Germans would be "dependent upon the goodwill and charity" of the American and Japanese manufacturers.

The overseas competitors profess courteous respect for the European Mega Project. They do not appear to be terribly frightened by it. "Success, by our standards, does not only mean to be on top of the technology," says the manager of a U.S. chip manufacturing plant, "but also, to make a profit with it."

That would indeed be a real trick for the Siemens managers. Their component division has just gone into the black for the first time in many years. But that could change in a hurry. There is no other market in which demand and prices are on as much of a rollercoaster as in the case with the chips. And market research firms like Dataquest in the United States predict that by the end of the decade there will be a further reduction in the European firms' market share for worldwide chip production.

It could happen that in that case the Siemens money managers will get scared of their own courage. But by decision of the research ministry officials, there will be no backing away from the Mega Project. Chip specialist Thomas knows that "a few precautionary measures are built in" to ensure the firm's necessary commitment for the next phase also.

9273
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MICROELECTRONICS

SIEMENS OPENS ULTRA-MODERN CHIP FACTORY IN AUSTRIA

Vienna DIE PRESSE in German 16 Nov 84 p 20

[Text] Villach-Siemens is considerably expanding its microelectronics activities: yesterday it opened Europe's most up-to-date chip factory in Villach (Carinthia). With this new 1.5 billion [Austrian] schilling facility, the Austrian subsidiary of the German corporation hopes to reduce the technological lead of its Japanese and U.S. competitors. The present chip factory in Villach will increase its production by about 50 percent in the current fiscal year, thus making microelectronics one of the fastest growing lines of the corporation.

In early 1985, the Siemens factory "Villach II", which was opened yesterday, will start production of 256 K chips. This will be the first time that an Austrian enterprise plays a leading role in microelectronics. The production of 256 K memories, which can store the characters of 16 full DIN-A4 pages in an area of 33 square millimeters, is currently restricted to only three enterprises in the whole world: Fujitsu, Hitachi and NEC.

At present, even though production in Villach has not even started, work is already proceeding on the next chip generation. Siemens is developing, among other things, a mega-bit chip which will have four times the memory capacity of the 256 K chip. This chip is to be produced from 1987 on in a factory to be constructed in Regensburg (Bavaria). After 1989 a four-mega-bit memory is to go into production; Siemens is currently developing it jointly with Philips.

The investment required for entering such a high-tech area is enormous. According to Siemens-Austria Director General Walter Wolfsberger, the creation of one job in the 256 K factory costs about 20 million schillings, compared with an average of 1 million schillings for other industrial jobs. In Villach itself Siemens has invested 2.7 billion schillings to date. At present there are 1,161 employees; shortly they will number 1,400.

At a press conference in Villach last Wednesday, Wolfsberger stated that sales at the Villach factory during fiscal year 1983/84 (until the end of September) amounted to 834 million schillings. In the current fiscal year, sales will

increase by 50 percent to more than 1.2 billion schillings. Ninety nine percent of the production will be exported.

Worldwide, Siemens had sales of 4.2 billion schillings in the last fiscal year on integrated circuits, which also represents a growth of 50 percent.

About 65 engineers are working on research projects in Villach. They will become still more busy: the technology lag in microelectronics is still 2 years with Japan and 6 months with the United States.

The traditional business area of Siemens-Austria showed a less explosive growth: according to Wolfsberger, group sales during the fiscal year ending last September have grown 7 percent to 14.7 billion schillings. Sales of Siemens-Austria AG climbed 6 percent to 11 billion schillings. Sales orders for the group grew by 4 percent to 15 billion schillings; however the corporation orders remained unchanged at 10.6 billion schillings. Siemens-Austria will probably once again pay a 16 percent dividend.

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MICROELECTRONICS

BRIEFS

PHILIPS PROFITS UP--Eindhoven, November 28--Philips Gloeilampenfabrieken NV expects a growth in profits next year of up to 25 per cent, and a six per cent rise in volume sales, executive board member J. Zantman said in New York today. The company's profit has doubled in the past four quarters and Zantman repeated an earlier forecast that net profit this year will rise to one billion guilders on a turnover of more than 50 billion. Addressing U.S. investment analysts, he said next year's profit rise would bring Philips closer to its target of raising after-tax profit to three per cent of turnover, on condition that turnover rises by six per cent and inflation remains unchanged. Next year's estimates take into account an expected reduction in the growth of the American economy, Zantman said. Growth in the company's overall profits would slow somewhat to a maximum of 25 per cent, and although U.S. profits would increase, it would not be at the same rate as in 1984, he said. The exceptional demand for electronic chips was also likely to slow down next year, leading to more normal growth percentages, he added. But against this, Philips was likely to reap the benefits in 1985 of a major reorganisation of its European plants in recent years, he said. [Text] [The Hague ANP NEWS BULLETIN in English 29 Nov 84 pp 1-2]

CSO: 3698/149

SCIENTIFIC AND INDUSTRIAL POLICY

SIEMENS HEAD ON GOVERNMENT AID TO RESEARCH

Duesseldorf HANDELSBLATT in German 5 Nov 84 p 3

[Article: "The International Technological Race Has Turned into a Competition Among Economies--A Letter to FRG R&T Minister Riesenhuber Concerning Government Support for Research"]

> [Text] 3, 4 November 1984--In a letter to FRG Research and Technology Minister Dr Heinz Riesenhuber, which is reproduced verbatim below, Professor Dr Karl-Heinz Beckurts of the Siemens AG board of directors, deals with the subject of direct research grants.

"In public discussions we are forever hearing the statement that direct research grants cost the taxpayer a lot of money, but that no concomitant achievements arise from such support. Also, that the money mainly benefits large corporations which do not even need it. Siemens is often referred to in this context.

Industrial research and development are a basic task of free enterprise. It must decide at its own risk what direction and extent research activities are to take. During fiscal year 1982/83, Siemens spent almost DM 3.5 billion for Research and Development; in 1983/84 this figure rose to DM 3.8 billion. No other industrial enterprise in Europe has spent more, not in this or other lines of business.

During the last 10 years Siemens has expended an average of 8.8 percent of sales on R&D, which is considerably more than other major electronics manufacturers; the average for Philips was 7.1 percent, for General Electric 6.7 percent, for IBM 6.2 percent. For information technology alone we have spent about DM 1.8 billion in the past year.

The international technological race has long since progressed from a competition among corporations to a competition among economies. This challenge is clearly recognized by other Western states. A major part of the competition occurs in the rapidly innovating areas of electronics. Siemens is facing this situation with a broader product spectrum than any other electronics manufacturer and, as a private enterprise, is therefore by far the biggest employer in the FRG in manufacturing the products of the future.

At the same time, Siemens is on the one hand competing against firms which reach a very high share of the market with a much narrower product spectrum and which, while spending relatively less of their own funds, are able to expend much greater amounts for research and development in their market segment--e.g., IBM and AT&T, more than DM 5 billion per year. On the other hand, Siemens competes against firms which obtain more than 50 percent of their R&D funds from outside sources through government contracts (GE, ITT, Westinghouse) or whose risk is limited by their governmental owners(e.g., France) making up for losses incurred.

In the FRG, private funds pay for up to 80 percent of the total R&D expenditures. Except for Japan, where the special relationship between state and economy precludes comparisons, the economy of the other major Western industrial countries (France, Great Britain and the United States) pays for only about 70 percent of its R&D costs.

No Doubt About the Usefulness of Indirect Support

In fiscal year 1982/83, FRG support for Siemens R&D projects amounted to DM 212 million. That was approximately 6 percent of the total expenditure of DM 3,470 billion for Research and Development. Of this, the KWU Group received about half (DM 107 million); the main beneficiaries were the Alkem and Interatom subsidiaries. This went primarily for the support of projects designed to ensure satisfaction of long-term FRG energy requirements. For Siemens, other than KWU, the amount received was DM 105 million. Considering the expenditure of DM 3,142, this amounted to about 3 percent. Besides, the KWU Group is working on contracts which are financed from the FRG Ministry for Research and Technology's budget, e.g., the SNR 300 fast-breeder reactor in Kalkar. Commingling such contracts with the R&D grants is not appropriate.

According to the FRG Research Report for 1984, the private sector expended about DM 31.6 billion for Research and Development in 1983. Siemens's share of this was about 10 percent. Excluding the advanced reactor projects, direct FRG R&D grants in 1983 to the private sector amounted to DM 2.1 billion; of this, Siemens overall received about 10 percent; Siemens exclusive of the KWU only about 5 percent. Direct project grants for Siemens are therefore no greater than the R&D share of the private sector.

Siemens R&D projects frequently are directed toward further improvements in basic technologies and have therefore considerable impact beyond the corporation itself. Examples for this are the energy area, automation and production technology and information technology. These technological points of emphasis are also part of government programs which are designed to produce modern technologies of importance to the national economy. Proposals for R&D projects under these programs are publicly solicited. It is therefore obvious that in selecting projects to be supported, Siemens be given adequate consideration.

The capability of an enterprise for conducting research and development activities can of course be reinforced also by routine money grants, tax breaks or a general improvement in their operating situation. There is no intent here

of casting doubt upon the usefulness of indirect measures for the utilization and marketing of available technologies. But only specific measures could cause key technologies of special national interest to become available within the country. Of the project concerned is particularly risky and capital-intensive, the government must commit itself to equal the efforts of the enterprise. Otherwise we would face the threat of an increasing dependence upon technology imports. The risks to the national economy of that type of procedure are demonstrated by the ongoing discussions about technology transfers. Research support by the government can only serve as assistance for achieving breakthroughs in areas which the enterprise itself considers to be of special importance. The economic prospects of success for long-term R&D efforts consist, especially in the capital-intensive new technologies, of the fact that on the one hand the necessary personnel and technical capabilities are available for the long term; on the other hand, that there is sufficient economic backup for market penetration. For this reason, performance capability must be the prerequisite of any decision in favor of support.

Even though government grants cover only a very small part of the total research and development costs, such support has made it possible for selected projects to be approached by taking greater risks and on a larger scale than could have been justified from a purely local operational aspect. Considerable achievements have come about as a result of this support.

In nuclear technology the FRG has today a leading worldwide position, especially from the standpoint of reliability and the safety record. Siemens has markedly contributed to this. Government support played a part in this; it was provided specifically for R&D activities in that field.

The very great expenditures made by Siemens in the area of data processing for developing hardware, software and tools necessary for competence in this product area have been supported by the government. Siemens is now the only independent manufacturer of main frame computers with their own operating systems in Europe.

One point of emphasis in government research support are electronic components, especially the highly integrated chips. Siemens has by now achieved a high level of development in the process technologies and high quality and reliability standards in the products, which provides a firm basis for the technological performance capability of the enterprise.

Large Contributions to Joint Venture Research

Support for research is a component of overall research policy, which requires trust and active cooperation between government, economy and science. Siemens makes large contributions to this by supporting the efforts of the Ministry for Research and Technology for joint venture research and by participating in a great number of joint projects with other firms and institutes. As an extension of cooperation with research institutes which has been going on for a long time, Siemens is spending considerable amounts of its own money to support research and development projects at German universities. Among many others, there is Project EIS (integrated circuit design) in which Siemens, in

coordination with the Ministry, made a special software system for the design of integrated circuits available to a number of universities. This group of universities will be enlarged considerably by expenditure of enterprise money. There are plans for establishing an institute, funded jointly by Siemens and the Society for Mathematics and Data Processing.

In conclusion: project support grants as a part of government technological programs are intended for the performance of particularly long-term, large-scale and risky research and development activities. The objective here is not a short-term advantage for the enterprise, but rather the reaching of joint government-private sector goals through research. In pursuing such ambitious goals, Siemens is, by virtue of its wide R&D spectrum and its technological capabilities, a competent partner for the government and for science."

9273
CSO: 3698/123

SCIENTIFIC AND INDUSTRIAL POLICY

FRG RESEARCH, TECHNOLOGY MINISTRY BMFT LISTS 1983 FUNDING

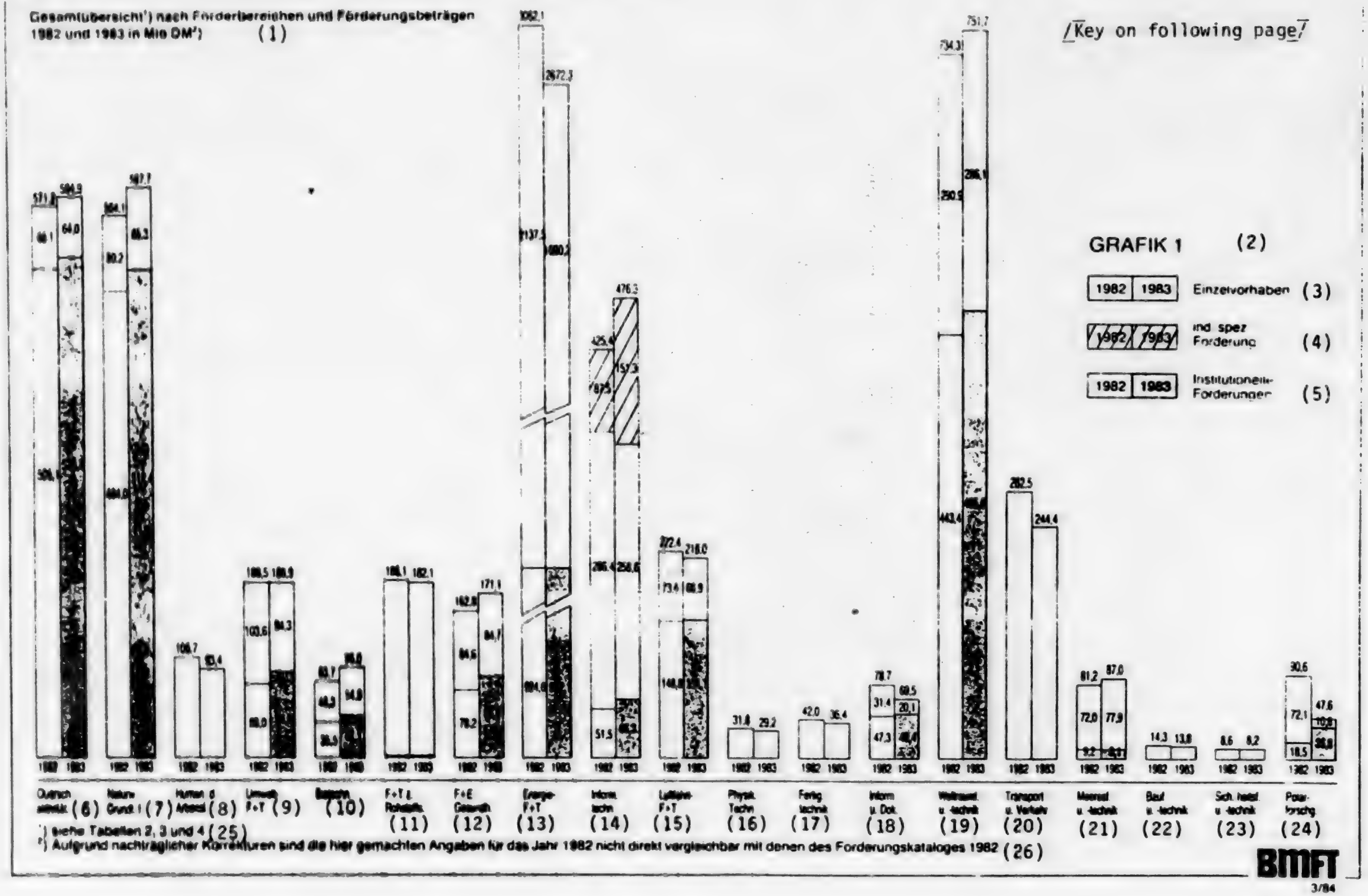
Bonn BMFT FOERDERUNGSKATALOG 1983 in German Mar 1984 pp 2-613

[Excerpts from report 'BMFT FOERDERUNGSKATALOG 1983' ('BMFT Catalog of Grants 1983'). Beginning with the biotechnology section, only grants over DM 3 million are included. The catalog also contains grants in the fields of basic research in natural science, humanization of the workplace, environment research and technology, and research and technology in the fields of raw materials, medicine, energy, physics, information and documentation, transportation and traffic, oceans, construction, public safety and polar research. The catalog can be obtained for free from: Bundesminister fuer Forschung und Technologie, Heinemannstr. 2, 5300 Bonn 2, FRG. For list of 1982 grants, see JPRS-WST-84-006 of this series dated 13 Feb 84, pp 33-63.]

[Excerpts]

Overview of Grants in All Fields

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 2-10



Key:

1. Overall survey[1] according to funding areas and funding amounts in 1982 and 1983 in millions of DM[2]
2. Graphic 1
3. Individual projects
4. Individual special funding
5. Institutional funding
6. Cross-section activities
7. Basic scientific research
8. Humanization of working life
9. Environmental research and environmental engineering
10. Bioengineering
11. Research and Technologies for the securing of raw materials
12. R&D related to health
13. Energy research and energy engineering
14. Information technologies
15. Aviation research and aviation engineering
16. Physical technologies
17. Production engineering
18. Information and documentation
19. Space research and space engineering
20. Transport and traffic engineering
21. Oceanographic research and engineering
22. Construction research and engineering
23. Safety research and engineering
24. Polar research
25. [1]See Tables 2, 3, and 4
26. [2]Because of subsequent corrections, the data given here for 1982 are not directly comparable with those of the 1982 funding catalog.

Overall Survey - Institutional Funding 1), Project Funding 2), and Other Individual Projects 3)
According to Funding Areas and Funding Amounts 1982 and 1983 in DM 4)

Table 1 Funding Area	Number of Projects 1982	Funding Amount 1982	Number of Projects 1983	Funding Amount 1983	Rate of Increase in Percent
00 Cross-section activities	106	571.171.564	108	584.883.102	2,40
01 Basic scientific research	647	564.120.107	674	597.723.441	5,96
02 Humanization of working life	353	106.686.567	325	93.404.773	-12,45
03 Environmental research and environmental engineering	401	188.541.990	457	188.908.727	0,19
04 Bioengineering	128	83.736.660	158	95.962.108	14,60
05 Research and Technologies for securing of raw materials	887	188.074.507	907	182.066.968	-3,20
06 R&D related to health	422	162.792.757	416	171.127.531	[illegible],12
07 Energy research and energy engineering	1.062	3.062.094.347	1.068	2.672.250.222	-12,73
08 Information technologies, individual ind. special research (total 08)	527	337.914.948 87.467.709 (425.382.658)	497	324.964.782 151.312.279 (476.277.061)	-3,83 72,99 (11,96)
09 Aviation research and aviation engineering	77	222.357.508	81	218.045.031	-1,94
10 Physical technologies	135	31.789.441	139	29.244.241	-8,01
11 Production engineering	221	41.978.321	186	36.372.342	-13,36
12 Information and documentation	94	78.689.728	104	69.546.464	-11,62
13 Space research and space engineering	421	734.267.697	416	751.684.400	2,37
14 Transport and traffic engineering	227	282.474.379	240	244.393.637	-13,48
15 Oceanographic research and engineering	238	81.194.684	208	86.998.451	7,15
16 Construction research and engineering	50	14.307.264	39	13.847.548	-3,21
17 Safety research and engineering	39	8.644.312	39	8.196.080	-5,19
19 Polar research	10	90.564.031	7	47.630.438	-47,41
Totals	6.045	6.851.400.812	6.069	6.417.250.285	-6,34
Additional Ind. Spec. Funding		87.457.709		151.312.279	72,99
Total		6.938.868.521		6.568.562.564	-5,34

1) See Table 2
2) See Table 3
3) See Table 4
4) Because of subsequent corrections, the data given here for 1982 are not directly comparable with those of the 1982 funding catalog.

Institutional Funding and Disbursements to Foreign and International Institutions According to Funding Areas and Funding Amounts
1982 and 1983 in DM

Table 2

Funding Areas	Institutional Funding				Disbursements to Foreign and International Institutions							
					Member Contributions				Other Contributions			
	1982		1983		1982		1983		1982		1983	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount	No.	Amount	No.	Amount
00 Cross-section activities	18	490.067.020	18	505.890.000	2	12.271.228	2	12.113.664	4	2.727.526	4	2.044.756
01 Basic scientific research	8	290.786.806	8	313.679.642	1	193.176.961	1	198.714.086				
03 Environmental research and environmental engineering	4	84.729.656	4	94.648.729					1	230.000		
04 Bioengineering	3	24.340.288	2	28.300.000	2	11.141.559	2	12.773.589				
05 Research and Technologies for securing of raw materials									2	51.000	2	51.815
06 R&D related to health	4	78.152.358	4	86.449.977								
07 Energy research and energy engineering	8	887.068.445	8	944.843.772	2	30.710.909	2	31.280.525	4	5.989.683	4	5.932.843
08 Information technologies	5	51.548.774	4	66.326.033								
09 Aviation research and aviation engineering	2	148.757.508 1)	2	151.100.818 1)								
12 Information and documentation	13	47.285.436	15	49.428.683								
13 Space research and space engineering	3	107.487.251	3	116.645.979	1	335.972.823	1	340.946.519				
15 Oceanographic research and engineering	4	9.135.581	3	9.040.250	1	11.685	1	11.870	1	77.988	1	75.000
18 Polar research	2	18.484.495	2	36.517.309								
Totals	74 2)	2.238.543.617	73 2)	2.403.171.193	9	583.285.166	9	603.840.253	12	9.076.197	11	8.904.414

1) This item contains means from the budget of the BMVG
2) Number of approvals for 39 funded institutions

Project Funding - R&D Projects Including R&D-Relevant Investments, Studies, Expert Opinions, Auxiliary Projects and Project Services 1) According to Funding Areas and Funding Amounts 1982 and 1983 in DM 2)

Table 3

Funding Area	Number of Projects 1982	Funding Amount 1982	Number of Projects 1983	Funding Amount 1983	Rate of Increase in Percent
00 Cross-section activities	54	45.394.551	41	40.237.583	-11,36
01 Basic scientific research	621	80.049.033	657	85.317.066	6,58
02 Humanization of working life	342	106.271.254	320	93.142.031	-12,36
03 Environmental research and environmental engineering	396	103.475.390	450	93.378.732	-9,76
04 Bioengineering	120	48.078.692	151	54.535.430	13,43
05 Research and Technologies for securing of raw materials	880	186.582.429	898	180.644.892	-3,18
06 R&D related to health	416	84.502.591	410	84.612.211	0,13
07 Energy research and energy engineering	1.011	2.077.602.227	1.026	1.654.436.165	-20,37
08 Information technologies, individual ind. special research (total 08)	515	285.890.609 87.467.709 (373.358.319)	489	258.490.983 151.312.279 (409.803.262)	-9,58 72,99 (9,76)
09 Aviation research and aviation engineering	72	73.486.030	75	66.724.605	-9,20
10 Physical technologies	135	31.789.441	138	29.040.641	-8,65
11 Production engineering	219	41.378.321	184	35.692.530	-13,74
12 Information and documentation	80	31.394.322	87	20.103.627	-35,97
13 Space research and space engineering	405	290.163.490	401	286.030.429	-1,43
14 Transport and traffic engineering	225	281.898.694	237	243.954.762	-13,46
15 Oceanographic research and engineering	229	71.876.055	201	77.271.412	7,51
16 Construction research and engineering	68	14.207.366	37	13.759.660	-3,15
17 Safety research and engineering	34	8.282.744	36	7.920.897	-6,37
18 Polar research	8	72.109.536	4	10.726.362	-85,13
Totals Additional Ind. Spec. Funding Total	5.808	3.934.432.776 87.467.709 4.021.900.485	5.842	3.336.020.017 151.312.279 3.487.332.296	-15,21 72,99 -13,29

1) Not included are institutional fundings, disbursements to foreign and international institutions (Table 2) as well as other individual projects (Table 4)
2) Because of subsequent corrections, the data given here for 1982 are not directly comparable with those of the 1982 funding catalog

Other Individual Projects - Funding of Scientific Growth (Foreign Stipends) of International Exchange of Experience 1) and Other Funding According to Funding Areas and Funding Amounts 1983 in DM

Table 4

Funding Area	Funding of Scientific Growth No.	Funding of Scientific Growth 1983 Amount of Funding	Funding of International Exchange of Experience No.	Funding of International Exchange of Experience 1983 Amount of Funding	Other No.	Other 1983 Amount of Funding
00 Cross-section activities	.		10 .	10.265.445	33 .	13.531.654
01 Basic scientific research	.		8 .	12.647	.	
02 Humanization of working life	.		.		5 .	262.742
03 Environmental research and environmental engineering	.		3 .	881.267	.	
04 Bioengineering	1 .	320.000	.		2 .	33.089
05 Research and Technologies for securing of raw materials	.		5 .	1.289.986	2 .	80.276
06 R&D related to health	.		1 .	22.200	1 .	43.143
07 Energy research and energy engineering	.		9 .	13.539.150	19 .	22.217.767
08 Information technologies	.		4 .	147.766	.	
09 Aviation research and aviation engineering	.		2 .	105.345	2 .	114.263
10 Physical technologies	.		.		1	203.600
11 Production engineering	.		2 .	679.813	.	
12 Information and documentation	.		.		2 .	14.153
13 Space research and space engineering	1 .	85.586	3 .	361.514	7 .	-385.627
14 Transport and traffic engineering	.		2 .	345.000	1 .	93.875
15 Oceanographic research and engineering	.		.		2 .	599.919
16 Construction research and engineering	.		.		2 .	87.888
17 Safety research and engineering	.		2 .	158.950	1 .	116.233
18 Polar research	.		.		1 .	86.767
Total	2	405.586	51	27.809.082	81	37.099.741

1) This contains international exchange of scientists, travel, resident studies, courses, meetings, congresses, symposia, colloquia. Additional means are contained in a series of institutional fundings

Individual Projects 1) According to Performing Agencies and Funding Amount 1982 and 1983 in DM 2)

Table 5

Funding Area	Economy				Institutions of Higher Education				Research Institutions Not Related to Education				Other Performing Agencies			
	No.	1982 Amount of Funding	No.	1983 Amount of Funding	No.	1982 Amount of Funding	No.	1983 Amount of Funding	No.	1982 Amount of Funding	No.	1983 Amount of Funding	No.	1982 Amount of Funding	No.	1983 Amount of Funding
00 Cross-section activities	13	8.490.230	17	7.301.570	7	3.032.974	2	2.503.734	41	34.713.164	41	33.557.602	21	19.071.418	24	20.671.608
01 Basic scientific research	1	126.670			582	64.036.626	604	69.402.002	86	15.195.060	41	15.046.911				
02 Humanization of working life	201	67.058.510	185	56.135.000	64	11.260.750	64	10.034.630	62	10.374.925	54	10.613.070	24	9.167.376	22	8.622.056
03 Environmental research and environmental engineering	156	60.900.430	182	63.500.016	138	19.445.501	109	22.775.025	65	13.565.373	81	14.003.010	37	9.671.026	31	13.093.139
04 Bioengineering	61	29.560.057	51	27.160.961	52	10.066.905	73	14.925.530	20	8.120.955	26	10.354.105	2	297.015	4	2.439.063
05 Research and technologies for securing of raw materials	510	120.951.134	477	107.944.653	267	32.060.036	290	40.123.796	104	23.499.439	110	29.517.333	16	3.204.097	11	4.429.372
06 R&D related to health	130	28.060.910	126	32.201.238	202	28.173.070	200	28.700.567	51	15.000.329	50	15.650.970	35	13.135.277	36	7.956.707
07 Energy research and energy engineering	514	1.935.532.344	642	1.472.600.360	186	57.459.400	183	43.993.334	197	120.120.127	184	147.219.940	49	24.405.352	45	26.379.240
08 Information technologies, individual ind. special research (total 08)	312	187.808.520 87.467.709 (275.276.229)	277	174.944.728 101.312.279 (276.257.007)	80	31.779.059	101	23.811.597	99	51.364.170	96	50.039.024	23	15.416.425	19	9.062.601
09 Aviation research and aviation engineering	44	60.848.299	46	63.306.720	6	1.026.654	7	892.842	4	2.957.097	5	2.015.993	1	1.070.151	1	649.457
10 Physical technologies	108	22.999.665	98	19.293.117	20	3.072.296	21	3.606.966	16	4.579.040	20	4.670.906	1	1.137.900	3	1.593.251
11 Production engineering	130	26.223.047	106	22.203.738	50	6.406.706	44	5.041.274	35	8.707.387	34	8.209.763	1	400.700	2	237.574
12 Information and documentation	18	1.003.190	25	2.622.606	24	4.737.900	22	5.177.699	40	21.133.474	35	11.149.970	7	3.549.600	7	1.167.504
13 Space research and space engineering	171	206.151.936	157	165.964.464	124	16.276.900	165	18.910.272	116	49.318.744	102	54.020.499	8	19.120.065	8	46.396.667
14 Transport and traffic engineering	170	249.807.176	181	217.014.528	30	8.232.932	29	3.657.415	16	7.948.407	16	3.677.002	13	16.705.062	14	29.043.095
15 Oceanographic research and engineering	131	38.063.952	109	47.952.956	29	6.744.205	27	7.720.046	58	24.625.069	56	20.362.793	14	1.056.003	11	1.035.535
16 Construction research and engineering	42	12.503.201	33	18.909.942	3	414.369	2	84.318	2	234.000			3	1.355.674	4	773.600
17 Safety research and engineering	24	4.767.673	20	5.467.623	6	646.361	12	1.116.695	8	1.130.470	7	1.403.929	1	100.000		107.833
18 Polar research	4	62.490.267	2	656.297	1	3.075.453	1	3.302.916	3	6.535.816	1	6.607.151			1	86.767
Totals Additional Ind. Spec. Funding Total	2.837	3.142.986.193 87.467.709 3.230.453.902	2.721	2.479.456.319 101.312.279 2.638.760.597	1.863	309.666.033	2.045	306.708.656	996	427.300.636	967	449.562.540	256	148.544.970	243	165.606.903

1) Not included herein are industrial funding, disbursements to foreign and international institutions (Table 2)
2) Because of subsequent corrections, the data given here for 1982 are not directly comparable with those of the 1982 funding catalog

Individual Projects 1) According to Type of Research and Funding Amount 1983 in DM 2)

Table 7

Funding Area	Basic Research No.	Basic Research 1983 Amount of Funding	Applied Research No.	Applied Research 1983 Amount of Funding	Development No.	Development 1983 Amount of Funding
00 Cross-section activities	10	22.905.290	19	16.476.336	27	13.284.399
01 Basic scientific research	666	85.322.445	13	5.813	.	1.655
02 Humanization of working life	12	2.330.405	285	83.237.011	22	2.663.656
03 Environmental research and environmental engineering	13	2.136.690	228	34.695.931	202	55.118.456
04 Bioengineering	65	17.892.416	94	29.828.259	10	6.428.361
05 Research and Technologies for securing of raw materials	19	1.633.450	586	122.469.234	293	54.902.220
06 R&D related to health	14	1.797.769	232	48.378.243	162	30.515.436
07 Energy research and energy engineering	72	26.992.669	608	353.773.103	344	1.281.163.370
08 Information technologies, individual ind. special research (total 08))	69	17.913.002	89	32.073.446	346	197.879.256 151.312.279 (349.191.534)
09 Aviation research and aviation engineering	.		11	3.286.397	64	62.292.038
10 Physical technologies	6	1.203.288	37	8.181.706	94	18.586.940
11 Production engineering	1	20 000	172	31.743.245	10	2.056.724
12 Information and documentation	7	1.866.5[illegible]8	72	16.331.885	7	1.165.954
13 Space research and space engineering	289	96.685.648	29	34.532.807	86	137.652.772
14 Transport and traffic engineering	7	1.655.822	24	17.423.720	199	219.524.299
15 Oceanographic research and engineering	38	13.487.650	101	40.311.178	60	20.955.738
16 Construction research and engineering	.		6	2.309.286	31	11.450.374
17 Safety research and engineering	2	595.876	33	7.040.086	1	284.934
18 Polar research	3	10.545.810	1	180.552	.	
Totals Additional Ind. Spec. Funding Total	1.233	304.984.777	2.638	882.278.240	1.958	2.115.926.358 151.312.279 2.267.238.637

1) Not included herein are institutional funding, disbursements to foreign and international institutions (Table 2)
2) This table cites only approvimate values, since not all projects could be unambiguously assigned to one of the three areas and therefore could be considered only in terms of their emphasis

Grants Over DM 5 Million

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 13-20

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Fast Breeder Power Plant Company MBH 4300 Essen 1	Erection of the 280-MW-SNR Prototype Nuclear Power Plant (SNR 300)	1970 - 86	334,764,556
International Sodium Breeder Reactor Building Company MBH (INB) 5060 Bergisch Gladbach 1			
High Temperature Nuclear Power Plant GmbH (HKG) 4700 Hamm 1	Erection of the 300-MW-THTR Prototype Nuclear Power Plant (THTR 300)	1970 - 85	334,033,589
Consortium THTR C/O Brown, Boveri & Cie AG (BBC) 6800 Mannheim 31			
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8012 Ottobrunn	Experimental Installation of a Magnetic Train in Emsland	1978 - 84	125,250,253
Business Area of New Traffic Systems of the MBB 8000 Munich 22			
Eurosatellite GmbH 8000 Munich 22	Development and Production of the German and French Radio Satellite TV-SAT and TDF-1	1981 - 85	42,098,448
Power Plant of Union AG (MWU) 8520 Erlangen 2	American-German-Japanese Research Project to Analyze the Refilling and Flooding Phase in the Emergency Cooling of DWRs [pressurized water reactor] (2D/3D)	1981 - 85	38,666,340
German Society for the Reprocessing of Nuclear Fuels MBH (DWK) 3000 Hannover	The Planning, Erection, and Operation of the Pamela Demonstration Installation in Mol for the Vitrification of Highly Radioactive Wastes	1979 - 85	38,173,600
National Aeronautics and Space Administration (NASA) Washington/USA	Performance of the fi German Space Lab Mission D 1 (Technology Laboratory): Furnishing the Required Starting Services of the NASA Space Transportation System by NASA	1982 - 85	35,043,397
Physical-Technical Federal Institute 3300 Braunschweig	Site Exploration Program at Grrleben	1982 - 85	33,599,000

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Ruhrkohle AG 4300 Essen	Construction and Operation of a Coal-Oil Large-Scale Experimental System	1983	30,000,000
Ruhrkohle Oil and Gas GmbH 4250 Bottrop			
Uranit GmbH 5170 Juelich 1	Development Program for the Project of Uranium Enrichment With Gas Centrifuges - Gas Ultracentrifuges	1980 - 85	25,737,812
AEG Telefunken Systems Engineering AG 2000 Wedel	Development and Prototype Construction of Photovoltaic Energy Supply Systems	1981 - 86	25,388,743
Business Area of Industrial Systems, Ship Construction, and Special Engineering of AEG Telefunken Systems Engineering AG 2000 Wedel			
Model Power Plant at Voelklingen GmbH 6000 Saarbruecken	Development, Erection, and Testing of an Environmentally Compatible Anthracite Coal Power Plant	1982 - 84	24,906,780
Product Area of the Nuclear Power Plants of the Saar Mines AG 6600 Saarbruecken			
Society for the Gasification of Anthracite Coal MBH 4600 Dortmund 1	Construction and Operation of a 10 T/H Prototype System for a VEW Coal Conversion Process (Pressurized Operation)	1982 - 85	23,000,000
Salzgitter AG 3320 Salzgitter 41	Development of a Tube Reactor Method for Catalytic Very-High-Pressure Hydrogenation of Brown Coal and Anthracite Coal	1982 - 84	16,373,524
Salzgitter Industrial Construction GmbH 3320 Salzgitter 41			
Societe Arianespace F- Evry/Frankreich	Ordering an Ariane launch for TV-SAT	1981 - 85	15,584,749

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	R&D Program, in Conjunction With Planning, for SNR [fast sodium-cooled reactor] Further Development	1983 - 85	14,709,840
Working Society of Industrial Research Associations E.V. (a registered association)(AIF) 5000 Cologne 51	Funding of External Contractual Research	1978 - 85	13,145,604
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	R&D Program on the SNR 300, Associated with Construction	1983 - 85	12,087,354
Dornier GmbH 7990 Friedrichshafen	Technological Manager for the Investigation of New Possibilities for Amphibian Aircraft - Phase II	1980 - 84	12,000,000
Rhenish Brown Coal Works AG 5000 Cologne 41	Experimental Operation of the Pilot Plant for Hydrogenating Coal Gasification (HKV) 1983 to 1985	1983 - 85	11,776,632
Erno Space Travel Engineering GmbH 2800 Bremen 1	Project Space Lab Mission D 1, Payload Integration - Phase C/D	1982 - 85	11,555,403
Thyssen AG 4100 Duisburg 11	Efficient Energy Utilization in an Integrated Metallurgical Plant by CO-Gas Recovery and Utilization	1979 - 87	11,500,000
National Coal Board Ltd. International Energy Agency Services GB- London/Great Britain	Construction and Operation of an Experimental System for Basic Engineering Investigations on Fluidized Bed Combustion Under Pressure. The results being worked out form the basis for the design of commercial systems of this conception.	1979 - 84	11,460,370
Mining Research GmbH 4300 Essen 13	Prototype for Nuclear Process Heat (PNP), R&D Work on Steam Gasification of Coal	1982 - 84	11,033,052
German Federal Railroad, Central Office Munich 8000 Munich 2	IC-E (Wheel/Rail Testing and Demonstration Vehicle)	1982 - 85	10,500,000
Kloeckner Coal Gas GmbH 2800 Bremen	Coal Gasification in the Eisenbad Reactor - Non-Investment Part, Process Related - Phases I and II, Section 1: Expanded Research and Optimization Program	1981 - 84	10,448,717

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Nuclear Research Center at Karlsruhe GmbH (KFK) 7500 Karlsruhe 1	Safety Studies on the HDR [possibly superheated steam reactor] System to Expand Knowledge Concerning the Properties and Structural Behavior of the Systems and Components of a Light Water Reactor	1976 - 84	10,430,649
GFK Society for Coal Liquifaction MBH 6600 Saarbruecken	Expansion of the Raw Materials Basis of Refining by Including Anthracite Coal; Six TATO Pilot System for Coal Hydrogenation	1983 - 85	10,353,772
Project Group, Pilot Plant on Coal Hydrogenation of the GFK 6620 Voelklingen			
National Center of Space Studies (CNES) F- Paris/France	Expansion of the Telecommunication System for Africa South of the Sahara, Including the ATHOS Satellite	1983 - 84	10,000,000
Karlsruhe Nuclear Research Center GmbH (KFK) 7500 Karlsruhe 1	Lava (The Storage and Vaporization of Highly Active Liquid Wastes), Supply Central	1975 - 84	10,000,000
High Temperature Reactor Construction GmbH 6500 Mannheim 1	PNP Development Work on the Nuclear Heat Generating System (PNP-NWS)	1983	10,000,000
Interatom International Atomic Reactor Construction GmbH	PNP Development Work on the Nuclear Heat Generating System (PNP-NWS)	1983	10,000,000
High Temperature Nuclear Power Plant GmbH (HKG) 4700 Hamm 1	Erection of a 300 MWE Thorium High Temperature Nuclear Power Plant	1983	10,000,000
Consortium THTR C/O Brown, Boveri & Cie AG (BBC) 6800 Mannheim 31			
Heliotronic Research and Development Company for Solar Cells - Basic Materials MBH 8263 Burghausen	Silicon - Material Development for Terrestrial Solar Cells	1982 - 86	9,500,000
Dornier System GmbH 7990 Friedrichshafen	ROSAT (Time-Plan-Critical Work): Components With Long Delivery Times	1983 - 85	9,475,421
Brown, Boveri & Cie AG (BBC)	Development of Sodium/Sulfur Storage Batteries	1981 - 85	9,384,457

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Central Research Laboratory of the BBC 6900 Heidelberg 1			
Siemens AG 8000 Munich 80	Development of CMOS Gate Arrays and Cell Components With Their Associated Design Methods	1982 - 85	9,353,261
Business Area of Components of Siemens AG 8000 Munich 80			
Senator for Economy and Traffic of the Province of Berlin 1000 Berlin 62	Energy Saving Propulsion Technology for Elevated Local Railways - Testing the Roadway Migrating Field Drive for the U-Train in Berlin	1982 - 88	9,303,780
Kavern Construction and Operating GmbH 3000 Hannover 1	Investigation of Relevant Process During and After the Flooding of the Potassium Salt Mine HOPE - Technical Implementation	1983 - 86	9,298,259
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19	Construction and Preparation of Working Documents for a Laboratory for SUB-MYM Technology at the Berlin Electron Storage Ring	1982 - 86	9,274,479
Fraunhofer Inst. for Solid State Technology (IFT) 8000 Munich 60			
Siemens AG 8000 Munich 90	Development of Dynamic VLSI Memory Components	1983 - 85	9,234,431
Business Area of Components of Siemens AG 8000 Munich 90			
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	Engineering Program GAST	1981 - 86	8,850,000

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
United States Department of Energy Washington/USA	Coal-Oil Demonstration System in the USA - GULF-SRC II	1974 - 84	8,561,914
Solvent Refined Coal International Inc. Englewood/USA			
Alkem GmbH 6450 Hanau 11	The Recycling of Plutonium	1983	7,929,414
Veba Oel AG 4650 Gelsenkirchen	Pilot Project for the Ruhr Hydrogenation System	1982 - 84	7,628,459
Salzgitter AG 3320 Salzgitter 41	Construction and Testing of a Large-Scale Low-Temperature Pyrolysis System for Eliminating Special Wastes in the Recovery of Raw Materials and Energy	1982 - 86	7,600,000
Otto & Comp. GmbH. D. DR. 4630 Bochum 1			
Minerva Society for Research MBH 8000 Munich 2	Funding the Scientific Collaboration with the Weizmann Institute, Rehovot/Israel and Funding the German-Israeli Exchange of Scientists	1983	7,600,000
Howaldtswerke-German Shipyards AG Hamburg and Kiel 2300 Kiel 14	Prototype Construction and Testing of an Underwater Operations and Pipeline Repair System SUPRA	1983 - 84	7,134,409
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	Engineering Work for the Multi-purpose Research Reactor MPR 30 for the Indonesian Research Center Puspiptek	1981 - 86	6,800,000
Senator for Education, Science, and Art of the Free Hanseatic City of Bremen 2800 Bremen 1	Supplementing the Technical-Scientific Basic Equipment of the German Antarctic Research Station, Georg-Von-Neumayer	1981 - 86	6,687,151
Industrial Systems Operating Company MBH (IABG) 8012 Ottobrunn	Operating Contract 1983 Including Measurements for Adapting to the State of the Art (Title 104 and 1038)	1983	6,607,000

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Rhenish Brown Coal Works AG 5000 Cologne 41	Coal Gasification in the High-Temperature Winkler Gasifier	1981 - 83	6,577,361
Magnetic Train GmbH 8130 Starnberg	Further Development and Testing of a New Technology for Local Traffic Means With the Title: Roadway Migrating Field Propulsion (M-Train System)	1979 - 84	6,300,000
Society for Mathematics and Data Processing MBH (GMD) 5205 Sankt Augustin 1	Draft of Integrated Switching Circuits (EIS) - Investments	1983 - 84	6,300,000
Dornier System GmbH 7990 Friedrichshafen	Research Project Concerning a Material-Science Experiment Double Rack for Experimental Modules and Systems, MEDEA	1981 - 84	6,216,332
Siemens AG 8000 Munich 80	1 MYM-MOS Technology	1983 - 86	6,216,132
Business Area of Components of Siemens AG 8000 Munich 80			
Karlsruhe Nuclear Research Center GmbH (KFK) 7500 Karlsruhe 1	Proportionate Operating Costs of the SIN [Swiss Institute for Nuclear Research] for Experiments Performed by German Groups	1983 - 84	6,137,663
Siemens AG 8000 Munich 80	New Architectural Features and Basic Components for VLSI Processors	1981 - 84	6,122,549
Working Association on Pressurized Gasification, Ruhr Gas AG/Ruhr Coal AG/Steag AG 4300 Essen 1	Production of Synthesis Gas, City Gas, and Natural Exchange Gas from the Pressurized Gasification of Granulated Anthracit With Oxygen - Lurgi Pressurized Gasification	1982 - 84	6,085,538
Uranit GmbH 5170 Juelich 1	Operation of Uranite in Juelich and Development Programs in the Area of Uranium Enrichment	1979 - 83	6,030,500
GKSS Research Center Geesthacht GmbH 2054 Geesthacht	Kuwait Seawater-RO-Experimental System	1980 - 85	6,008,585

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Thyssen Gas GmbH 4100 Duisburg 11	Methanization of Coal Gasification Gases in a Fluidized Bed, Pilot Development Stage	1980 - 84	5,891,689
Working Association on the Ship of the Future, Represented by Howaldts Works - German Shipyards AG Hamburg and Kiel 2300 Kiel 14	Development of a New Ship Propulsion Technology for the Ship of the Future	1980 - 85	5,823,896
Hobeg High Temperature Fuel Element GmbH 6450 Hanau 11	Development Program for Fuel Elements With Low-Enriched Uranium for High-Temperature Reactors	1982 - 85	5,636,543
MVP Testing and Planning Society for Magnetic Railway Systems MBH 8000 Munich 2	Operation of a Large Testing System for a Magnetic Train System, Evaluation of This System From the Point of View of the User, and Support During Marketing	1981 - 85	5,561,026
German Society for the Reprocessing of Nuclear Fuels MBH (DWK) 3000 Hannover 1	Solidification of Highly Radioactive Waste Solutions in Borosilicate Glass for Safe Final Storage of Fission Products	1982 - 83	5,484,000
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	Safety Program in Connection With Further SNR Development	1983 - 84	5,477,491
Organization for Economic Collaboration and Development (OECD) - International Energy Agency (IEA) Paris/France	The Fenton Hill Hot Dry Rock Geothermal Project	1979 - 85	5,428,030
United States Department of Energy U.A. Washington/USA			
United States Department of Energy Washington/USA	Collaboration in the Loft Program (Loss of Fluid Test)	1983 - 86	5,326,400
Idaho National Engineering Laboratory Idaho Falls/USA			

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95	Development and Testing of a Rudder Box for the Airbus in a Fiber-Composite Construction-Phase III	1982 - 84	5,211,200
Business Area on Transport and Traffic Aircraft (UT) of the MBB 2103 Hamburg 95			
Nukem GmbH 6450 Hanau 11	Other Waste Removal Techniques for Burned-out Nuclear Fuel	1981 - 84	5,209,500
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80	A Cooled Infrared Labratory GIRL, Performance of a System and Mission Analysis. Development, Construction, and Space-Travel Qualification of the Qualification Model, Improvement of the Qualification model to a Flight Model, Performance of Acceptance Tests	1978 - 85	5,171,696
Business Area on Space Travel of the MBB 8000 Munich 80			
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1	Investigation of Plasma Transport by the Solar Wind Into the Magnetosphere by Means of Artificially Injected Plasma Clouds	1980 - 86	5,143,400
Max-Planck Institute for Physics and Astrophysics - Institute for Extraterrestrial Physics 8046 Garching			
Federal Institution for Geosciences and Raw Materials (BGR) 3000 Hannover 51	Investigation of the Geological Structure, the Geological Development, and the Hydrocarbon Potential of the Dangerous Grounds/South Chinese Sea With MS Sun (Trip 50-27)	1983	5,128,259
Interatom International Atomic Reactor Construction GmbH 5060 Bergisch Gladbach 1	Further Development of the High-Temperature Reactor - Component Project II: Project on Nuclear Process Heat (PNP)	1982 - 84	5,048,771

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Amount of Funding 1983 in DM
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8012 Ottobrunn	Technology of Novel Dynamic Systems for Helicopters	1981 - 84	5,029,548
Krupp Steel AG 4630 Bochum 1	The Recovery of Previous Waste Heat From Perceptible and Chemically Bound Heat of the Offgases of a Modern Basic Oxygen Steel-Making Plant, for the Remote Heat Supply of the City District Duisburg-Rheinhausen	1978 - 84	5,009,258

Grants in Biotechnology

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 179-200

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
European Laboratory for Molecular Biology (EMBC) 6900 Heidelberg 1	Basic Research in Molecular Biology	1983	10,760,068
Society for Biotechnical Research MBH (GBF) 3300 Braunschweig	Operation (Task Definition and Annual Working Program 1983 see Below)	1983	20,500,000
Society for Biotechnical Research MBH (GBF) 3300 Braunschweig	Investments (Task Definition and Annual Working Program 1983 see Below)	1983	7,800,000
Society for Biotechnical Research MBH (GBF) 3300 Braunschweig	The GBF has the Task of Carrying on Research and Development in the Area of Biotechnology Within a Multi-disciplinary Association A) Process Engineering; B) Genetic and Microbiological Techniques; C) Enzyme Technology; D) Metabolic Products and Structural Elucidation; E) Cellular Mechanisms	1983	
Bayer AG 5090 Leverkusen Plant Protection Department of Bayer AG 5090 Leverkusen	New Plant Protection Agents From Microorganisms III	1980 - 83	12,900,000
Nattermann & Cie GmbH, A. 5000 Cologne 30	Research on a New Technology for Isolating and Standardizing Natural and Synthetic Phosphatides, for Use in Plant Protection and Pharmacology	1983 - 86	3,504,912
Mining Research GmbH 4300 Essen 13	Development of Biotechnical Methods for the Treatment of Waste Waters From Coal Refining	1983 - 87	3,459,930
Gruenenthal GmbH 5190 Stolberg Research Department of Gruenenthal GmbH 5100 Aachen	Isolation and Purification of Urokinase	1983 - 85	3,559,053

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Nattermann & Cie GmbH, A. 5000 Cologne 30	Isolation of Fractions and Substances, by Means of PZK (Expansion Unknown), for a Pharmacological-Biochemical Screening to Find Therap. Relev. Action Principles, for Obtaining Synst. Hard-to-Access or Scarce Raw Materials	1979 - 84	6,419,115
Schering AG 1000 Berlin 65	Cultivation and Breeding of Solanum Marginatum and Isolation of the Steroid Basic Material Solasodin Which is Contained in Fruits, in Developing Countries/ Ecuador	1980 - 84	6,889,777
Heidelberg University 6900 Heidelberg Inst. for Biological and Medical Research of Heidelberg University 6900 Heidelberg	Development and Application of Gene-Engineering Methods for Problems of Bioengineering and Medicine	1982 - 85	17,883,300
Bioferon Biochemical Substances GmbH 7958 Laupheim 1	Continuation of the Production and Testing of Interferon	1981 - 83	9,930,225
Bioferon Biochemical Substances GmbH 7958 Laupheim 1	Production and Testing of Human Gamma-Interferon	1982 - 86	9,066,486
Boehringer Mannheim GmbH 8132 Tutzing Tutzing Plant of Boehringer Mannheim GmbH 8132 Tutzing	From Cells Obtained by Means of the Hybridoma Technology, the Genes of Antibodies are to be Isolated, Introduced into Microorganisms Through Suitable Vectors, and Experiments are to be Performed on Them There	1981 - 84	4,018,700
Society for Bioengineering Research MBH (GBF) 3300 Braunschweig	Production of Interferons and Lymphokines	1982 - 84	3,776,000
Society for Radiation and Environmental Research MBH (GSF) 8042 Oberschleissheim International Office of the GSF 8042 Oberschleissheim	German-Israeli Collaboration: Natural Substances From Biological Material - Phase III (DISNAT III)	1982 - 84	3,667,174

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Inst. for Breeding Research (Erwin-Baur-Inst.) 5000 Cologne 30	Molecular Gene and Cell Engineering	1982 - 86	16,150,800
Degussa AG 6000 Frankfurt 1 Technical Area on Research Chemistry of Degussa AG 6450 Hanau 1	Development of Enzymatic and Microbial Methods for Amino Acid Synthesis	1982 - 86	6,100,050
Henkel KGAA 4000 Duesseldorf	Fermentation Processes to Produce Viscous Polysaccharides - Using Xanthane as an Example	1982 - 84	4,235,840
Hoechst AG 6230 Frankfurt 80 Central Research II - Bioengineering - of Hoechst AG 6230 Frankfurt 80	Biological Surface-Active Agents: Search for New Biological Surface-Active Agents That Can be Produced by Bioengineering, Their Development Through a Fermentation Process and Appropriate Processing, Testing of Such Natural Substances	1983 - 86	3,783,328
Association of Chemical Industries E.V. 6000 Frankfurt 1	Interdisciplinary Program to Promote Top Performance and to Transfer Know-how in Biological Sciences	1983 - 85	4,000,000
German Research Association E.V. (DFG) 5300 Bonn 2	Genome Organization and Gene Expression (Projects Predominantly in Colleges)	1983 - 86	4,500,000

Grants in Information Technology

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 439-494

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Society for Mathematics and Data Processing, MBH (GMD) 5205 Sankt Augustin 1	Operation (Task Definition and Yearly Working Program 1983 - see below)	1983	51,564,900
Society for Mathematics and Data Processing, MBH (GMD) 5205 Sankt Augustin 1	Investments (Task Definition and Yearly Working Program 1983 (see below)	1983	4,011,157
Society for Mathematics and Data Processing, MBH (GMD) 5205 Sankt Augustin 1	Tasks of the BMD: A) R&D as Well as Technical and Scientific Training and Education in the Area of Data Processing and its Application and in the Areas of Mathematics Which are Especially Important for This Purpose; B) Consultation and Support of Public Administrations Especially the Federal Government in the Promotion, Introduction, and Development of Data Processing; C) Operation of Data Processing Systems for the Above Tasks and for Furnishing Subsidiary Computer Capacity for Purposes of the Corporate Members	1983 Work Program A) System Knowledge; B) Technology of Software Production; C) Office Communication; D) Alternative Models for Administrative Systems That are Supported by Information Technology; E) Planning Models for Public Tasks; F) Cross-section Tasks; G) Analysis and Forecasts; H) Efficiency Research; I) Technical Standardization and Legal Regulation as Well as the Transfer of R&D Results; J) Scientific-Technical Services	
Camic Working Society for Computer-Aided Microprocessing of the PCS GmbH/ Softlab GmbH 8000 Munich 81	Implementing a Computer-Supported Integrated System for Hardware and Software Development for Microcomputer Applications	1980 - 83	4,468,646
Krupp Atlas Electronics GmbH 2800 Bremen 44	Process Computer Structures Parallel and Decentralized Structures of Process Computers With High System Reliability	1982 - 84	3,304,278

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Nixdorf Computer AG 4790 Paderborn Development Area of Nixdorf Computer AG 4790 Paderborn	Fail-safe Data Manager for Distributed Office Systems	1982 - 84	5,383,517
Nixdorf Computer AG 4790 Paderborn Development Area of Nixdorf Computer AG 4790 Paderborn	Computer-aided Software Production Environment - Case	1982 - 83	3,445,810
Siemens AG 8000 Munich 83 Business Area on Data and Information Systems of Siemens AG 8000 Munich 83	Data Protection Techniques for Medium-to-Large DP Systems	1981 - 83	8,535,000
Softlab GmbH for System Development and EDP Applications 8000 Munich 81	Design and Development of an Intelligent Work Station for Software Development	1983 - 86	6,599,980
MBP Mathematical Consultation and Programming Service GmbH 4600 Dortmund 1	Implementation of a Portable, Method-Oriented Software Development System (MOSES) Based on a Coordinated Method Bundle (SOKOL)	1980 - 83	5,224,991
Triumph-Adler AG for Office and Information Technology 8500 Nuernberg 80	Conception, Implementation and Introduction of Industrial Methods for the Development and Production of Software Products	1980 - 84	3,119,312
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) Fraunhofer-Inst. for Production Systems and Construction Engineering (IPK) 1000 Berlin 30	German-Norwegian Collaboration "Advanced Production System" (APS)	1981 - 84	4,448,500
Aachen Technical College 5100 Aachen Laboratory for Machine Tools and Management of Aachen Technical College 5100 Aachen	German-Norwegian Collaboration "Advanced Production Systems" (APS)	1981 - 85	5,877,836

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90 Main Department on Central Data Processing of the DFVLR 8031 Wessling	Functional Association Between Siemens-Transdata and IBM-SNA 3-Computer Centers - SNATCH	1980 - 83	7,673,983
Hahn-Meitner Inst. for Nuclear Research Berlin GmbH (HMI) 1000 Berlin 39	Computer Communication Through Standardized Protocols	1979 - 83	3,736,263
Senator for Science and Research of the Province of Berlin 1000 Berlin 19 Large Computer Center for Science in Berlin (GRZ) U.A. 1000 Berlin 31	The Planning, Development, and Implementation of Interfaces and Protocols for the Connection of Large Computers, Data Stations, and Terminal Concentrators to an X.25 Transport System, Installation of a Network for the Purpose of Functional Interlinkage	1977 - 83	6,535,884
Association of German Computer Centers E.V. (VDRZ) 3000 Hannover 1	Pilot Applications of the Public Data Packet Service for the Linkage Between Service Computer Centers and Computer Center Clients	1979 - 83	8,207,483
AEG Telefunken Communications Engineering AG 7750 Konstanz Business Area on Information Technology of the AEG Telefunken, Communications Technology AG 7750 Konstanz	Reading Unit for Texts	1982 - 85	4,466,767
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19 Fraunhofer Inst. for Information and Data Processing (IID) 7500 Karlsruhe 1	Combined Picture Processing System for the Interpretation of Industrial Scenes	1983 - 85	4,267,650
Siemens AG, 8000 Munich 83 Business Area of Data and Information Systems of Siemens AG, 8000 Munich 83	Basis Concept for Office Systems	1982 - 84	4,330,336

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
UNI Stuttgart 7000 Stuttgart 1 Inst. for Information Technology of the UNI Stuttgart 7000 Stuttgart 1	The Function of Integrated Information Dialogue Systems in Man-Machine Communication	1981 - 85	3,532,100
AEG Telefunken Systems Engineering AG 4788 Warstein 2 Business Area, Components of the AEG Telefunken Systems Engineering AG 4788 Warstein 2	Semiconductor Switching Elements for High Power (GTO)	1982 - 85	3,313,150
Telefunken Electronic GmbH 7100 Heilbronn	Bipolar Integration Technology for Highly Complex Analog-Digital Circuits	1983 - 86	5,834,792
Wacker Chemitronics Society for Electronic Basic Materials MBH 8263 Burghausen	Component-Correlated Material Optimization in III/V Compound Semiconductors	1983 - 85	4,848,850
Eurosil Electronic GmbH 8057 Eching	Working Out and Testing a Powerful CMOS Technology for Low Voltages	1983 - 86	4,110,506
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19 Fraunhofer Inst. for Solid State Technology (IFT) 8000 Munich 60	Investigations on X-ray Lithography by Means of Synchrotron Radiation	1977 - 83	10,032,300
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19 Fraunhofer Inst. for Solid State Technology (IFT) 8000 Munich 60	Investigations on X-ray Lithography by Means of Synchrotron Radiation	1982 - 83	6,856,000

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19 Fraunhofer Inst. for Solid State Technology (IFT) 1000 Berlin 33	The Use of the Bessy Storage Ring System: R&D Projects for the Working Association on X-ray Lithography	1983 - 85	3,719,300
Rosenthal Engineering AG 8672 Selb	Ceramic Single- and Multiple-Layer Substrates for Integrated Circuits	1982 - 85	3,430,162
Siemens AG 8000 Munich 80	Preliminary Work in the Development of VLSI Processes With 1 MYM Structures	1981 - 84	9,223,631
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	Development of Basic Technologies for Miniaturizeable MOS Processes With 1-Micrometer Structures	1981 - 85	7,715,401
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	Development of a 1 MYM Bipolar Technology	1983 - 85	9,204,253
Siemens AG 8000 Munich 90 Business Area of Components of Siemens AG 8000 Munich 90	Development of Dynamic VLSI Memory Components	1983 - 85	14,402,170
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	1 MYM-MOS Technology	1983 - 86	51,770,578
Valvo Components Business Area of Philips GmbH 2000 Hamburg 1	Basic Development of a 1.5μm VLSI Technology, Part 2	1982 - 85	4,844,581

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Berlin Electron Storage Society for Synchrotron Radiation MBH (BESSY) 1000 Berlin 33	Planning an 800 MEV Electron Storage Ring for Synchrotron Radiation and Measures to be Taken for its Construction	1978 - 84	58,400,000
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) 8000 Munich 19 Fraunhofer Inst. for Solid State Technology (IFT) 8000 Munich 60	Build-up of Design Capacity at the Fraunhofer Inst. for Solid State Technology in Munich	1982 - 84	3,530,600
Society for Mathematics and Data Processing MBH (GMD) 5205 Sankt Augustin 1	Design of Integrated Switching Circuits (EIS) -	1983 - 86	7,205,133
Society for Mathematics and Data Processing MBH (GMD) 5205 Sankt Augustin 1	Design of Integrated Switching Circuits (EIS) - Investments	1983 - 84	10,919,667
Intermetall Semiconductor Works of the German ITT Industries GmbH 7800 Freiburg	Development Projects on a Digital Signal Processor	1982 - 84	3,110,017
Siemens AG 8000 Munich 80	VLSI Circuits for a Color TV Receiver	1980 - 83	5,749,838
Siemens AG 8000 Munich 80	New Architectural Characteristics and Basic Components for VLSI Processors	1981 - 84	16,106,406
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	Development of Simulation Methods and Investigation of Fine-Structure Effects for VLSI-MOS Technology	1981 - 85	5,887,238
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	Development of CMOS Gate Arrays and Cell Components With Associated Design Methods	1982 - 85	18,345,529

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Siemens AG 8000 Munich 90 Business Area of Components of Siemens AG 8000 Munich 90	VLSI Design System (VENUS) for Very Highly Integrated CMOS/NMOS Circuits	1983 - 85	9,462,420
Telefunken Electronic GmbH 7100 Heilbronn	Peripheral Subsystems for Microcomputers	1982 - 84	3,700,005
Telefunken Electronic GmbH 7100 Heilbronn	Special Operating Means for Development Projects in the Area of Semiconductor Technology	1983 - 84	8,471,320
Valvo Component Business Area of Philips GmbH 2000 Hamburg 1	Correlating and Adaptive Digital Filters	1980 - 83	3,110,461
Valvo Component Business Area of Philips GmbH 2000 Hamburg 1	Basic Development for a 1.5 μm VLSI Technology	1981 - 83	4,695,743
Valvo Component Business Area of Philips GmbH 2000 Hamburg 1	Development of a Single-Chip 16-Bit Microcomputer With a Modular Structure and Self Testing	1982 - 85	4,836,288
Fraunhofer Society for the Promotion of Applied Research E.V. (FHG) Fraunhofer Inst. for Solid State Technology (IFT) 8000 Munich 60	Support of Medium Industry in the Miniaturized Construction of Electronic Circuits	1981 - 83	3,302,200
Association of German Engineers (VDI) 4000 Duesseldorf 1 VDI Technology Center 1000 Berlin 30	Improvement in the Utilization of Technologies (With an Emphasis on Microelectronics) by Small and Medium Businesses	1981 - 84	12,919,761
Association of German Engineers (VDI) 4000 Duesseldorf 1 VDI Technology Center 1000 Berlin 30	Special Program on Applications of Microelectronics (Project Staff Costs)	1982 - 85	10,505,952
Valvo Component Business Area of Philips GmbH 2000 Hamburg 1	Development of a Semiconductor Picture-Taking Mechanism for Consumer Cameras	1983 - 85	7,200,000

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	Task Definition and Yearly Working Program 1983 - See Below	1983 - 84	12,460,800
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	Tasks of the HHI: General Foundations of Communications Technology, Systems Engineering, Picture and Audio Technology, Technology of Communications Transmission and Switching, Especially Optical Communications Technology; Integrated Optics; Terminal Device Engineering and Ergonomics; Scientific Analyses on the Development of Telecommunications	Reinforcement of Research Work in the Area of Optical Communications Technology and High-Resolution Television; Building up the Engineering Area of Integrated Optics, Development of Novel Broad-band Communication Services; Analyses and Forecasts Regarding Telecommunications (Among Other Things Video Screen Text-Accompanying Study for the Senate of Berlin)	
Heraeus Quartz Melt GmbH 6450 Hanau	Development of a Novel Method for the Production of Preforms for Light Conducting Fibers for Optical Communications Technology: Bulk-Body Technology	1983 - 86	12,658,686
Siemens AG 8000 Munich 90 Research Laboratories of Siemens AG 8000 Munich 83	GAAS Technology for Fast Electronic Circuits	1982 - 84	4,239,795
Siemens AG 8000 Munich 90 Research Laboratories of Siemens AG 8000 Munich 83	Optical Receivers and Receiver Modules	1982 - 84	4,535,972
Siemens AG 8000 Munich 90 Research Laboratories of Siemens AG 8000 Munich 83	Optical Transmitters and Transmitter Modules	1982 - 84	12,497,589

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
AEG Telefunken Systems Engineering AG 7900 Ulm Business Area on High Frequency Engineering of the AEG Telefunken Systems Engineering AG 7900 Ulm	Digital Receiver II	1982 - 84	4,198,244
AEG Telefunken Cable Works AG Rheydt 4050 Moenchengladbach 2	Methods for Large-Scale Production of Gradient Profile Fibers and Monomode Fibers	1982 - 84	4,956,616
ANT Communication Technology GmbH 7150 Backnang Research Inst. at Ulm of the AEG Telefunken 7900 Ulm	Optical Transmission and Receiving Elements for the Wavelength Range Between 1.2 μm and 1.6 μm, Especially at 1.3 μm	1982 - 84	7,655,000
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	The Transmission of Moving Pictures for Individual Communication	1983 - 86	3,397,300
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	Highly Integrated Signal Processors for Telecommunication	1983 - 86	4,286,070
Philips Comminications Industry AG 5000 Cologne 80 Philips GmbH Research Laboratory Aachen 5100 Aachen	Development of a Process for the Production of Components for Optical Communication Transmission Lines	1983 - 85	3,196,469
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich	Highly Integrated Circuits for Communications Technology	1979 - 83	7,603,813
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	Circuits of Microelectronics for the Area of Technical Communication	1982 - 85	8,808,710

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Siemens AG 8000 Munich 70 Business Area on Communications Engineering of Siemens AG 8000 Munich 70	Local Optical Network	1983 - 86	5,010,610
Siemens AG 8000 Munich 70 Business Area on Communications Engineering of Siemens AG 8000 Munich 70	Moving Picture Codecs as System Components for Digital Broadband Communication	1983 - 86	9,453,661
Siemens AG 8000 Munich 70 Business Area on Communications Engineering of Siemens AG 8000 Munich 70	Multi-functional Terminal Units for Future Digital Communication Networks	1983 - 86	7,069,449
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Research Center in Stuttgart of the SEL 7000 Stuttgart 40	Components for a High-Speed System With Large Repeater Distances at about 1200 NM Light Wavelength	1982 - 84	4,022,935
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40	Integrated Regenerators for Digital Glass-Fiber Transmission Systems	1982 - 84	3,258,289
Tekade Telecommunication Systems, Business Area of Philips Communications Industry AG 8500 Nuernberg 1 Philips GmbH Research Laboratory Hamburg U.A. 2000 Hamburg 54	A Subscriber-Proximate Communication System to Distribute Telecommunication Services Along Networks With Different Interfaces and Protocols	1981 - 84	4,483,338
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	High Resolution Presentation of Colored Moving Pictures	1981 - 84	8,110,650

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Siemens AG 8000 Munich 80 Business Area of Components of Siemens AG 8000 Munich 80	A Flat Video Screen	1983 - 85	3,512,945
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Research Center at Pforzheim of the SEL 7530 Pforzheim	A Graphic Office Printer With A Thermocolor Medium for ISDN Terminal Units, Short Title: Indirect Thermoprinter	1983 - 86	4,361,404
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Business Group on Communications Technology of the SEL 7530 Pforzheim	Textfax Laboratory Model for the Combined Processing of Texts and Facsimiles, and Communication at Digital Networks	1983 - 85	7,609,081
Heinrich-Hertz Inst. for Communications Technology Berlin GmbH (HHI) 1000 Berlin 10	A Multi-Subscriber Broadband Dialogue System	1980 - 83	9,504,058
City of Esslingen 7300 Esslingen	Integrated Computer-Supported Initial Management System for Esslingen	1979 - 83	4,184,000
Blaupunkt Works GmbH 3200 Hildesheim	Electronic Target Guidance System	1979 - 84	3,112,146
Deutsche Welle 5000 Cologne 1	Decentralized Electronic Communications Transmission System for Text Communication of Deutsche Welle and Deutschlandfunk	1978 - 83	4,425,531
Deutsche Welle 5000 Cologne 1	Decentralized Electronic Communications Transmission System for Text Communication of Deutsche Welle and Deutschlandfunk	1980 - 83	3,345,261

Grants in Aeronautics Research

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 499-510

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
*German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90	BMVG Defense Department Portion for Operations (Task Definition and Annual Working Program 1983 - See Appendix)	1983	48,221,648
*German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90	BMVG Defense Department Portion for Investments (Task Definition and Annual Working Program 1983 - See Appendix)	1983	7,680,117
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Messerschmitt-Boelkow-Blohm GmbH (MBB) 2800 Bremen 1	Integrated Wing-Propulsion System for Commercial Aircraft - Phase II	1981 - 84	10,484,092
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Messerschmitt-Boelkow-Blohm GmbH (MBB) 2800 Bremen 1	Development of a Technology for Extending the Payload and Mission Range of Future Aircraft of the Airbus Family	1982 - 84	5,602,940
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2103 Hamburg 95	Development and Testing of an Airbus Rudder Box made of Composite Fibers-Phase III	1982 - 84	16,251,472
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2103 Hamburg 95	Integration of New Components in Aircraft Design	1983 - 86	3,927,428

*The Institutional Fundings Listed Here Belong Both to the Area 09 Air-Travel Research and Technology as Well as to the Area 13 Space Research and Technology

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2800 Bremen 1	Development and Testing of Critical Components for the Technological Preparation of an Airbus Carbon Fiber Fuselage	1983 - 85	6,680,364
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2103 Hamburg 95	Load Reduction and Vibration Damping for Future Airbus Projects	1983 - 86	11,501,332
Dornier GmbH 7990 Friedrichshafen	Stimulation of New Technology (ANT) for Aircraft Associated With General Air Travel	1983 - 84	3,023,237
Dornier GmbH 7990 Friedrichshafen	Technology Manager for the Investigation of the Possibilities of Amphibian Aircraft - Phase II	1980 - 84	37,993,333
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8012 Ottobrunn	Avionic System for Future Civilian Helicopters - Phase II	1983 - 85	3,317,323
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8012 Ottobrunn	Technology of Novel Dynamical Systems for Helicopters	1981 - 84	16,877,718
MTU Engine and Turbine Union, Munich GmbH 8000 Munich 50	Increasing Energy Utilization in Cooled High-Temperature Turbines Phase II	1983 - 86	7,100,000
MTU Engine and Turbine Union, Munich GmbH 8000 Munich 50	Development and Testing of a Gas Generator With a New Technology for Airborne Propulsion Systems of Medium Power	1982 - 86	20,502,450
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2800 Bremen 1	Electrical Primary Control for Future Airbus Projects (Fly by Wire)	1983 - 86	6,825,189

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB 2800 Bremen 1	Control Systems of the Support Wing, Controlled Flow for Future Airbus Projects	1983 - 86	5,988,446
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Business Area on Defense and Air Travel of the SEL 7000 Stuttgart 40	Development, Production, Integration, and Testing of DME/P Transponders and Associated Onboard Units for Civilian Air Travel	1983 - 86	13,196,100
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Business Area on Defense and Air Travel of the SEL 7000 Stuttgart 40	Development of an Electric Rotating Antenna for the Emission of Navigational Signals in the L-Band by Using Rotary Fields (ELTA)	1983 - 86	3,971,540
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40	The DAS Program: PDME Planning, Coordination, Preparation for Testing, Development of Subassemblies, Integration and Tests	1980 - 83	5,958,472
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40	DAS-AZIMUT (Coordination, Development of Subassemblies, as Well as Accompanying Programs and the Dissemination of Scientific Information)	1980 - 83	3,332,787
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40	DAS - Onboard Unit (Coordination, Development of Subassemblies, Integration Test as Well as Supporting Activities)	1980 - 83	7,713,316
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8012 Ottobrunn	Avionic System for Future Civilian Helicopters	1980 - 83	4,356,884
North Micro Electronics and Fine Mechanics AG 6000 Frankfurt 63	Development of a Digital Air-Data Computer by Using Modern Microprocessors, Arithmetic Modules, and LSI Circuits and Sensors With a Pressure-Dependent Frequency Output	1980 - 83	3,155,355

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Standard Electric Lorenz AG (SEL 7000 Stuttgart 40	Development and Testing of a Miniaturized Fiber Gyro Suitable for Flight	1981 - 84	4,220,556
VDO Aircraft Devices Plant Adolf Schindling GmbH 6000 Frankfurt 50	Integrated Display-, Operating-, and Monitoring-System in the Aircraft Cockpit for Civilian Aircraft Applications	1983 - 85	5,926,888
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Messerschmitt-Boelkow-Blohm GmbH (MBB) 2800 Bremen 1	Development, Design, and Construction of Wind Tunnel Models for Aerodynamic Studies	1981 - 84	3,103,131
National Air and Space Travel Laboratory Amsterdam/Netherlands	Predesign Phase for the European Ultrasonic Wind Tunnel (ETW)	1978 - 84	5,826,715
German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90 Inst. for Flight Mechanics and Inst. for Flight Guidance of the DFVLR 3300 Braunschweig	Construction of a Redundant Digital Flight Guidance System With Flexible Arrangement of the Computer System Structure	1983 - 84	5,300,000
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95	Development and Testing of an NC-Controlled Rivetting Automat With Matched Loading Equipment for the Production of Spherically Deformed Aircraft Structures	1979 - 84	4,945,014
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2103 Hamburg 95 Business Area on Transport and Commercial Aircraft (UT) of the MBB) 2800 Bremen 1	Development of Application-Mature Computer-Supported Methods for the Integral Generation of Production Documents in Aircraft Construction - Phase III	1983 - 86	4,197,514

Grants in Production Technology

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 541-550

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Gear Wheel Factory, Friedrichshafen AG 7990 Friedrichshafen	Transformation of Working Conditions by a Linked Production System With a Modular Structure	1979 - 83	6,609,571
Grenzebach Machine Construction GmbH 8854 Asbach-Baeumenheim	Development of a Modular, Transferable Organizational Structure for Single Production Enterprises in Machine Construction (ORGAM)	1980 - 84	3,320,135
PSI Society for Process Control and Information Systems MBH 1000 Berlin 31	Implementation of a Computer Support Control System for Contract Procurement and Execution in Small and Medium Machine Construction Enterprises With Single Production	1982 - 84	3,262,991
Karlsruhe Nuclear Research Center GmbH (KFK) 7500 Karlsruhe 1	Support of Technology Transfer in the Production Engineering Program (Project Staff Costs)	1981 - 83	5,127,950

Grants in Outer Space Research

Bonn BMFT FOERDERUNGSKATALOG 1983 in German March 1984 pp 576-613

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
*German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90	Operation (Task Definition and Annual Working Program 1983 See Below)	1983	171,525,122
*German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90	Investment (Task Definition and Annual Working Program 1983 See Below)	1983	38,845,579
German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90 German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) - BPT 5000 Cologne 90	Space Research and Engineering (Project Staff Costs)	1983	17,135,000
European Space Organization (ESA) Paris, France	Contributions to the European Space Organization (ESA) Paris/France	1983	348,946,519
German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90	Performance of Tasks in the Areas of Air Travel Research, Space Travel Research, as Well as Research Tasks in the Area of Traffic and Communications Engineering, Materials, Energy Research, Polluted Emission, and Noise Reduction; the Accomplishment of Tasks Involving the Promotion of Products Through the Area of Project Management, Under Contract With the BMFT (Federal Ministry for Research and Technology)	A) Air Traffic Guidance; B) Aircraft; C) Turbo Propulsion Systems and Flow Machines; D) Non-nuclear Energy Systems; E) Satellite Communication and Location Finding; F) Earth Observation; G) Space Travel Systems; H)New Technologies, Technology Transfer	

*The Institutional Fundings Listed Here Belong Both to Area 13 Space Travel and Engineering as Well as the Area 09 Air Travel Research and Engineering

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
National Center for Space Studies (CNES) Paris/France	Expansion of the Telecommunication System for Africa South of the Sahara, Including the ATHOS Satellite	1983 - 84	15,000,000
Eurosatellite GmbH 8000 Munich 22	Development and Production of the German and French Broadcasting Satellite TV-SAT and TDF-1	1981 - 85	265,039,000
Industrial Systems Operating Co. MBH (IABG) 8012 Ottobrunn	Conjunction of 3M-WSA and ISA/TVA and Erection of a Space-Simulation System/Thermo-vacuum System (WSA/TVA)	1980 - 84	14,396,121
Societe Arianespace Evry/France	Ordering an Ariane Launch for TV-SAT	1981 - 85	92,097,596
Standard Electric Lorenz AG (SEL) 7000 Stuttgart 40 Business Area of Defense and Air Travel of the SEL 7000 Stuttgart 40	Development and Production of the Experimental Equipment for the NAVEX Flight Model	1981 - 85	9,975,352
Dornier System GmbH 7990 Friedrichshafen	Development, Construction and Testing of a Microwave Remote Sensing Experiment	1977 - 83	24,322,274
Erno Space Travel Engineering GmbH 2800 Bremen	Modification of the Series Measurement Chamber RMK A 30/23 for Space Lab Utilization and Development, Production and Testing of the Necessary Support Structures and a Remote Control Unit	1978 - 83	4,167,651
Messerschmitt-Boelkow-Blohm GmbH (HBB) 8000 Munich 80 Business Area on Space Travel of the MBB 8000 Munich 80	Modular Optoelectronic Multi-spectral Scanner Including Reproduction Unit for Magnetic Tape M14L	1980 - 84	9,436,752
British Aerospace Dynamics Group Bristol/Great Britain Electronic and Space Systems Group Bristol/Great Britain	Skylark 7 Motor Kits for TEXUS IV and V	1979 - 85	4,371,500

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Dornier System GmbH 79990 Friedrichshafen	Funding Project on Material-Science Experiments - Double Rack for Experimental Modules and Systems, MEDEA	1981 - 84	14,682,543
Erno Space Travel Engineering GmbH 2800 Bremen 1	Furnishing of 10 Mouse Modules for the Mouse Project	1979 - 84	13,003,863
Erno Space Travel Engineering GmbH 2800 Bremen 1	TEXUS V/VI Construction of an Experimental Payload Consisting of Four Flight Units With One Reserve Module Including Overall Integration and Campaign	1981 - 83	5,672,218
Erno Space Travel Engineering GmbH 2800 Bremen 1	Project Space Lab Mission D 1, Payload Integration - Phase C/D	1982 - 85	38,182,688
Kayser-Threde GmbH, Erwin 8000 Munich 70	Development and Construction of the Payload Element MEDEA for the D1 Mission	1981 - 84	7,489,066
Messerschmitt-Boelkow-Blohm GmbH (MBB) 2800 Bremen 1	Preparation of the WV Laboratory for Space Lab Mission D 1	1983 - 84	3,404,323
National Aeronautics and Space Administration (NASA) Washington/USA	Performance of the First German Space Lab Mission D 1 (Technology Laboratory): Furnishing the Required Starting Services of the NASA Space Transportation System by NASA	1982 - 85	161,650,000
Institute for Applied Geodesy (IFAG) 6000 Frankfurt 70 Institute for Applied Geodesy (IFAG) 6230 Frankfurt 80	Development and Operation of a Mobile Laser Measuring System for Range Measurements According to Artificial Satellites for the Purpose of Using Them in Geodynamic Research as Well as for Optimizing Orbit Measurements	1980 - 84	3,555,000
Dornier System GmbH 7990 Friedrichshafen	CAESAR Payload	1982 - 84	3,145,411
Dornier System GmbH 7990 Friedrichshafen	Airglow-Sun-Spectrometer Experiment	1977 - 83	3,880,097

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Institute for Aeronomy 3411 Katlenburg-Lindau 3	Development of a Telescope Camera for Flight on the ESA Space Probe GIOTTO to Study the Halley Comet	1982 - 85	7,394,000
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Institute for Aeronomy 3411 Katlenburg-Lindau 3	The Experiment SWICS (Solar-Wind-Ion-Composition Spectrometer) is Supposed to Measure the Charge-, Mass-, and Energy-Distribution of Ions in the Interplanetary Space Inside and Outside the Ecliptic and in the Jupiter Magnetosphere	1979 - 86	3,102,700
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Institute for Aeronomy 3411 Katlenburg-Lindau 3	Investigation of the Distribution Function of Energy-Rich Electrons and Ions in the Jupiter Magnetosphere	1977 - 85	3,289,850
Max-Planck Society for the Promotion of Sciences E.V. (MPG) Max-Planck Inst. for Nuclear Physics 6900 Heidelberg	Development and Construction of the Dust-Mass Spectrometer PIA for the ESA Comet Mission GIOTTO	1982 - 85	8,088,000
Max-Planck Society for the Promotion of Sciences E.V. (MPG) Max-Planck Inst. for Nuclear Physics 6900 Heidelberg	Measurement of the Chemical and Isotopic Composition as Well as Energy Distribution of Gases and Ions With the Experiment NMS on the GIOTTO Comet Probe of the ESA	1982 - 85	5,341,000
Max-Planck Society for the Promotion of Sciences E.V. (MPG) Max-Planck Inst. for Nuclear Physics 6900 Heidelberg	Development of the Dust Experiment for the JUPITER Orbiter Probe Mission of NASA	1977 - 84	6,185,338

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Inst. for Physics and Astrophysics - Institute for Extraterrestrial Physics 8046 Garching	Investigation of Plasma Transport From the Solar Wind Into the Magnetosphere by Means of Artificially Injected Plasma Clouds	1980 - 86	11,780,500
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80	Project GRO-COMPTEL Proposal for Phase C	1981 - 83	3,416,890
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80 Business Area of Space Travel of the MBB 8000 Munich 80	1. Performance of Modifications, Production, and Acceptance Tests of 400 N and 10 N Propulsion Units for the Project JOP-RPM. 2. Procurement, Preparation, and Maintenance of Fuels for the Project JOP-RPM	1977 - 83	47,661,493
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80 Business Area of Space Travel of the MBB 8000 Munich 80	Telescope COMPTEL on the NASA Gamma Ray Observatory: Phase D - MPE	1983 - 87	18,509,449
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80 Business Area of Space Travel of the MBB 8000 Munich 80	Telescope EGRET on the NASA Gamma Ray Observatory: Phase D	1982 - 85	5,339,564
Royal Norwegian Council for Scientific and Industrial Research (NTNF) Oslo/Norway Royal Norwegian Council for Scientific and Industrial Research (NTNF) - Space Activity Division Oslo/Norway	Agreement of Cooperation for the GUGATTI II Payloads, TRINGM II Payloads and HERO Payloads	1978 - 84	6,039,440

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Braunschweig Technical University 330 Braunschweig Institute for Geophysics and Meteorology of Braunschweig Technical University 3300 Braunschweig	Performance of Scientific Data Evaluation of Experiments No. 2 and No. 4 of the Solar Probe HELIOS A and B	1976 - 84	4,766,900
Bonn University 5300 Bonn Physical Institute of Bonn University 5300 Bonn	Precision Determination of the Relative Frequency of Helium in the 3- to 6-bar Region of the Jupiter Atmosphere Within the Framwork of the NASA Jupiter Orbiter and Probe Mission (JOP)	1978 - 86	5,189,425
Kiel University 2300 Kiel 1 Inst. for Pure and Applied Nuclear Physics of Kiel University 2300 Kiel 1	Design, Development, Production, Calibration, and Testing of an Instrument to Measure Electrons and Nucleons Above 4 MEV in Interplanetary Space and Outside the Ecliptic Onboard the ESA ISPM Probe	1978 - 86	6,463,700
Kiel University 2300 Kiel 1 Inst. for Pure and Applied Nuclear Physics of Kiel University 2300 Kiel 1	Scientific Data Evaluation of Experiment 6 in the Framework of the Project Solar Probe HELIOS A and B	1976 - 84	3,528,200
Dornier System GmbH 7990 Friedrichshafen	X-ray Satellite System Definition - Phase B2	1982 - 83	9,798,997
Dornier System GmbH 7990 Friedrichshafen	ROSAT (Time-Plan-Critical Work): Components With Long Delivery Time	1983 - 85	31,475,421
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Society for Physics and Astrophysics - Inst. for Extraterrestrial Physics 8046 Garching	X-ray Satellite Focal Instrumentation Part 1: Engineering Model and Operating Unit	1980 - 87	9,919,060

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Society for Physics and Astrophysics - Inst. for Extraterrestrial Physics 8046 Garching	Gamma Astronomy in the Energy Range 0.5 to 20 MEV	1979 - 86	4,075,900
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80 Business Area of Space Travel of the MBB 8000 Munich 80	A Cooled Infrared Laboratory GIRL, Performance of a System Mission Analysis. Development, Construction, and Space Travel Qualification of the Qualification Model, Improvement of the Qualification Model to a Flight Model, Performance of Acceptance Tests	1978 - 83	24,859,236
Carl Zeiss 7082 Oberkochen	X-ray Satellite: Production of the Verification Model	1982 - 84	3,020,783
Carl Zeiss 7082 Oberkochen	Development and Production of an Adjustment Stand for Performing the Adjustment Work in Connection With the Production of the Planned 4-Shell 80 CM-Wolter-Telescope	1980 - 84	6,120,554
Carl Zeiss 7082 Oberkochen	ROSAT Mirror System: Production of Individual Mirrors of the Flight Model up to X-ray Optical Acceptance	1982 - 85	5,877,779
Erno Space Travel Engineering GmbH 2800 Bremen	Payload Experiment Packet on Biosciences (NEXPA-BW) - Phase C/D	1982 - 85	5,300,213
Erno Space Travel Engineering GmbH 2800 Bremen 1	Process Chamber Experiments	1982 - 84	8,927,645
Kayser-Threde GmbH, Erwin 8000 Munich 70	Support of the Sled Experiment Packet During Its Integration Into the Payload Element Vestibular Sled and During the Space Lab D 1 Integration and Mission	1982 - 85	3,431,129

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Kayser-Threde GmbH, Erwin 8000 Munich 70	Development and Construction of the Training Model and Flight Unit of the Integrated Experimental System for the Space Lab Experiment 1 ES 201	1978 - 84	10,809,591
Mainz University 6500 Mainz Physiological Institute of Mainz University 6500 Mainz	It is Intended to Collaborate Closely With Industry so as to Develop and Test the Appropriate Hardware, and to Perform the Scientific Preliminary Investigations Which are Necessary for the Biomedical Studies of the Experiment Space-Sled	1977 - 84	3,229,339
German Research and Experimental Institute for Air and Space Travel E.V. (DFVLR) 5000 Cologne 90 Main Department on the Program Support of Space Travel of the DFVLR 5000 Cologne 90	Payload Operation of Space Lab Mission D 1	1983	3,500,000
Erno Space Travel Engineering GmbH 2800 Bremen 1	Delivery of Flight Standard Hardware - Two Units Double Rack	1980 - 83	3,475,808
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munich 80 Business Area on Space Travel of the MBB 8000 Munich 80	Space-Shuttle Mission SPAS-01	1979 - 84	17,200,498
Messerschmitt-Boelkow-Blohm GmbH (MBB) 8000 Munic 80 Business Area on Space Travel of the MBB 8000 Munich 80	Space-Shuttle Mission SPAS 01 A	1983 - 84	3,451,651
Erno Space Engineering GmbH 2800 Bremen 1	TEXUS 9/10 Experimental Payload Including System Test and Campaign Support	1983 - 84	3,248,797
Industrial Systems Operating Company MBH (IABG) 8012 Ottobrunn	Operations Contract 1983 Including Adaptation Measures to the State of the Art (Title 104 and 1038)	1983	6,607,00.

Receiver of the Allocation Performing Agency	Topic Task Definition	Running Time Beginning End	Total Amount of Funding in DM
Academy of Sciences and Literature in Mainz 6500 Mainz 1	Paleo Climatology as a Precondition for Long-Term Climatic Forecasts: Periodicity, Extent, Causes of Climatological Fluctuations and Human Influences on the Development of Climate	1982 - 84	3,437,980
Max-Planck Society for the Promotion of Sciences E.V. (MPG) 8000 Munich 1 Max-Planck Institute for Meteorology 2000 Hamburg 13	Procurement of a Large Computer for Investigating the Dynamic Behavior of the Global Climatological System With Its Regional Components	1983 - 86	8,336,000

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BELGIUM'S EYSKENS DISCUSSES PEGARD, BELL AFFAIRS WITH U.S.

Brussels KNACK in Dutch 10 Oct 84 pp 25-28

[Article by Karel Cambien: "A Minister Teaches Overseas"; passages enclosed in slantlines, printed in italics]

[Excerpts] Since the Pegard affair, Washington no longer considers Belgium the most loyal ally. Mark Eyskens eliminated a few misunderstandings on the spot.

The United States, September -- It is not always so easy for a minister traveling abroad to make contact with Brussels. Mark Eyskens, who recently criss-crossed the United States on a 10 day visit, also experiences this personally. Halfway through his trip one of those numerous telephone calls to Belgium had informed him that Washington was no longer willing to pay the promised 42 million francs for the Pegard unit.

That kind of Job's news arouses concern. Over there in California, near the Mexican border and a stone's throw away from Silicon Valley, otherwise a good place to talk about technology transfers, Mark Eyskens had hoped for better news. Outside the sun was once again shining brightly, but that morning the croissants and cups of coffee served to the Belgian minister of economic affairs did not tempt him at all.

Barely 48 hours later, and some 4,000 kilometers further, Eyskens could breathe again. Talks in Washington with the American Secretary of Commerce Baldridge and Secretary of Defense Weinberger closed with an /informal/ press conference. "The misunderstandings have been ironed out," said Eyskens. And then, not without humour: "But I was able to ascertain that the Walloon Pegard company is definitely not unknown here. We talked for a very long time about the Pegard company, but the talks were fruitful." Actually, Eyskens would also have liked to add: we talked /too much/ about Pegard, but he did not do it. A top Belgian diplomat in Washington then put it this crudely in the lobbies: "It is really unbelievable that this matter has gotten all this attention here. As if there were not much more important matters: the nuclear contract with Libya, or the once again slipping Bell contract, to name but a few."

The very full travel program did include an indirect reference to a discussion of the Pegard affair, but it did not seem to be of primary importance. Eyskens had enough other issues on the agenda in the United States: company visits, a few speaking engagements of his own, direct business negotiations here and

there, informal talks in between, and the sale of the slogan /New Economic Opportunities in Belgium/, which was the title of the promotion pamphlet distributed here on a large scale.

Having barely recovered from an overall nearly 20 hour long airplane trip from Brussels to San Francisco, Eyskens and his retinue were already allowed access to Silicon Valley, the Mecca of the American High Tech. Or perhaps not completely? In terms of high technology Silicon Valley (the area is actually simply called Santa Anna Valley) of course continues to set the tone in a very imposing way, but this does not prevent other High Tech oriented industrial parks from going up elsewhere (in and around Austin, Texas, for example, and in North Carolina), and with success. However, Silicon Valley still accomodates a number of companies closely related to Belgium, such as Sylvar Lisco, Barco Industries and Raychem, and this understandably still arouses interest in an economic mission like this one.

Misunderstanding

A flight from the American West Coast to the East Coast takes overall a little less than 6 hours. While quite a number of passengers on this kind of flight extensively sip drinks, or if necessary close their eyes, Eyskens could be seen working hard the whole time. According to press advisor Marc De Backer, the Belgian minister of economic affairs worked nowhere better than precisely on a plane. Eyskens was going to hold a few important talks with Baldridge and Weinberger in Washington. At the same time, barely a few streets away, Andrey Gromyko was received with much ceremony at the White House. Gromyko did not make any statements afterwards; Eyskens did, at an informal meeting in the richly furnished residence of the Belgian ambassador on Foxhall Road.

In its issue of that day, the WASHINGTON POST still talked of a renewed High Tech dispute between the United States and Belgium. The WASHINGTON POST published a communique from the State Department which clearly stated that the $700,000 to be paid for Pegard by the Reagan administration (the famous 42 million francs) would be withheld for the time being, given that Belgium would ultimately supply five Pegard units to the Soviet Union anyhow.

"A great deal is based on misunderstanding," said Eyskens following his talks with Baldridge and Weinberger. "When Belgium committed itself in August vis-a-vis the United States to continue to respect the COCOM regulations, it did not necessarily mean that not a single Pegard unit could be exported to the Soviet Union any longer. It was once again made clear to Baldridge and Weinberger that trade with the Eastern Bloc is much more important to us West Europeans than it is to Washington; as a matter of fact, this is proven more than clearly enough by the trade statistics. I also showed the American ministers a certificate which shows that the government of the FRG has already granted a licence for export to the Eastern Bloc for a unit similar to the one from Pegard. Well now, Belgium should not try to be more Catholic than the pope."

It also turned out that there was a great lack of clarity in Washington about the five new Pegard units. Prior to Eyskens' visit, it was still thought here that the Pegard units were "ready to be shipped." That is manifestly not the case given that the units are still in the process of being built. Nevertheless, Eyskens has already divulged all the technical details related to the Pegard units to Baldridge and Weinberger.

Washington is now studying those written Belgian specifications and, according to Eyskens, it has until July 1985 -- when the Pegard units are expected to be ready -- to come up with alternative proposals. If this does not occur, then the units will be exported to the Soviet Union; there seems to be little doubt left about that. The Eyskens visit has put the ball squarely in the American court. Both in terms of the destination of the Pegard units and in terms of the financial restructuring of Pegard, the next step is now up to Washington.

Because at the moment the Pegard affair is alas weighing too heavily already on the bilateral dialogue between Washington and Brussels, other issues -- which are not therefore less important -- have been pushed vigorously into the background. The famous China contract for Bell, for example, could once again produce problems. Because of the attitude of Washington the fulfilment of that 12 billion franc contract, which was definitively signed in the summer of last year, seems to have run into quite a bit of delay. The Americans also feel that for some parts of this contract -- specifically for the transfer of optical fibers -- permission from COCOM is required. In Belgium they know better than anywhere else what annoying situations this could lead to. Eyskens defended the position in the United States that the transfer of optical fibers is a typical example of an /administrative exception/. In concrete terms this means that Brussels should be able to decide on its own authority whether to grant an export licence. And Eyskens told the Americans this in so many words. As a matter of fact, he could call on a number of precedents in the matter.

The Japanese company Fujitso has already exported optical fibers to China without following COCOM procedures. In addition, during his visit to China Ronald Reagan himself signed a protocol which makes it possible to export this kind of equipment directly to Peking. But now suddenly Washington is being difficult again with regard to our country. At Bell itself this matter is obviously being followed closely.

The American position presumably arouses numerous questions at Bell. The longer this question drags on, however, the more face and credit Bell is likely to lose among the Chinese, and the consequences of that could very well be catastrophic. As a matter of fact, Bell also has other contracts on the way in China. Consequently, Eyskens defended this matter to the best of his abilities. For some time now it is being said in Washington that, in contrast to the past, Belgium is no longer simply an ally without problems.

Eyskens also looked into the possibility of setting up a cooperation agreement with the United States with regard to High Tech. For the moment, the Reagan administration has such agreements only with Israel and Japan. Both countries agree, via a monetary fund to be set up jointly (a so-called Binational Industrial Research and Development Foundation), to cooperate in matters of technology.

Definitely not the least important part of this mission was the promotion of our country as such. First in San Francisco, and then in New York, Eyskens provided a full explanation of investment opportunities in Belgium to a distinguished audience. He did not in the process hide the fact that in recent years our country has been quite remiss in attracting foreign capital. But since the advent of this government, a series of incentives have been granted which should produce a shift, according to Eyskens.

The Belgian minister of economic affairs, who was welcomed everywhere here as an /eminence grise/, repeatedly drew attention to regional initiatives such as Flanders' Technology, Operation Athene and Flanders' Interface. In a brochure entitled "New Economic Opportunities in Belgium" which was widely distributed here, our country's most important assets are singled out and highlighted. With a perfect feel for balance in terms of illustrations: two pictures from the Flemish region, two from the Walloon region, and one from Brussels.

Next Question

The problem of course is that all West European countries so to speak -- and not only them, in fact -- sing their own praises to Big Brother, in all possible ways. In this respect, Mark Eyskens was given a richly filled file from the Belgian representation in Washington. This showed, among other things, that not a single country spares either money or effort to draw attention. This happens most often via publicity in authoritative American or foreign journals and newspapers.

In this respect, Belgium has also failed quite a bit in recent years, but Eyskens let it be known that this will be remedied urgently. During a period in which the American /Eurosclerosis/ is gradually giving way to a rather substantial interest in Western Europe, this kind of campaign appears, alas, to be more and more a necessary condition.

However small our country may be, the Americans to whom Eyskens' speeches were addressed, turned out in quite a number of cases to be not totally uninformed about the Belgian situations. In San Francisco, for example, someone wanted to know what the relationship was precisely between the national government and the regional governments, whereupon Eyskens summarily explained the distribution of authority. Someone else questioned the chance of nationalization in our country, which was followed by a reassuring answer. A third person felt that everything Eyskens said was very nice, but what about the continuity of the policy being conducted in Belgium? Are there not elections planned for next year? Then the chairman, the moderator at the prestigious San Francisco Hotel, came particularly nicely out of his corner: "Next question," said the man promptly and with a wink. Eyskens himself laughed along heartily: he himself could not have come up with a more sly response.

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FINNISH TRADE EXPERTS DISCUSS IMPACT OF TRADE RESTRICTIONS

Helsinki SUOMEN KUVALEHTI in Finnish 9 Nov 84 pp 80-82

[Article by Martti O. Hosia: "High Tech or No Tech"]

[Text] Consultant Heikki K. Auvinen's occupation is to attempt to sell computers from Finland to the Soviet Union. U.S. Embassy Commercial Attache Max J. Ollendorf's job is to ascertain that Auvinen does not commit any excesses. High-tech trade with the East is like dancing on a trade policy tight-rope and those who fall off are eaten.

Upon hearing Auvinen's name, the director of a large computer firm first says "hm..." and then more emphatically "hmmm..."

"These matters are no joke. If things go badly, the whole country can be subjected to a boycott. Then what will happen to Finland's technical development," asks the director.

There are sufficient examples of warning in the world.

The Swedes were, indeed, anxious then the Americans disclosed that containers shipped from West Germany to Sweden contained computers bound for the Eastern bloc. The harbor bristled with the automatic pistols of the police, and the journey of these containers came to an end.

U.S. trade officials are currently investigating the Eastern transactions of the large Swedish firm Asea. Asea is suspected of being involved in the smuggling of computers to the Soviet Union.

A third subject of commotion is the black list published by the U.S. Department of Commerce, which lists five Swedish firms and a number of private individuals. Those on the list no longer receive American high-tech products.

The bad boy in West Germany is Richard Muller. The U.S. Department of Commerce recently slapped the world's second largest computer firm, Digital Equipment, with a 1.5-million dollar fine for improper dealings with Muller.

Behind all this is the U.S. embargo and export surveillance policy, which began to become tighter during President Jimmy Carter's human rights struggle

and became frozen in its present state after the occupation of Afghanistan and the declaration of martial law in Poland.

American firms can no longer export high technology to the East, in order to punish the Soviet Union. Computers and data transfer equipment such as telephone exchanges are at the top of the list of prohibited items. And if the equipment includes even one American computer chip, the whole piece of equipment is scuttled.

Suspected points of a leak are under the magnifying glass -- even Finland.

Business Idea from Embargo

Even difficult conditions are a challenge to a businessman.

The beginning of Auvinen's career was influenced by the fact that Auvinen had to choose between Church Slavonic and cobol computer language while studying Russian at the university. Auvinen chose cobol.

Later Auvinen worked in IBM's Soviet trade organization in Paris and as a Soviet sales chief for Stromberg-Data.

Now Auvinen directs the consulting firm, Asumer Company, which is part of the TMT companies.

The idea is to help a client obtain a computer order from the Soviet Union and after that the necessary permits from the United States.

Simple but complicated.

"I first encountered the embargo in 1976-77 when IBM's large systems transactions to Inturist were cancelled. It was feared that the systems would be used to provide surveillance on tourists," says Auvinen.

The next experience came in 1980 when Stromberg, which represented Data-General, was forced to cease the exports of computers to the Soviet Union. The computers were several months late and the atmosphere between the angry client and the manufacturer, who was being pressured by the embargo, became hateful.

Anyway, Finland would be an ideal location for shipping Western computers to the East. Servicing in computer transactions is of decisive importance and in Moscow to wait for a service man to come from Helsinki is quite a different matter than waiting for one from New York.

The late managing director of Finnish IBM, Olli Varho, was the first to think of this idea.

Many Finnish firms have the exclusive rights for selling American computers to the Soviet Union. But there is no use for these rights at this time.

Or perhaps there is. If Auvinen can arrange an export permit.

"Conflict Means a Market Opening"

"When there is a conflict between the USA and the USSR, there are market openings for us," states Auvinen in explaining his daring business idea. "We are offering control over export license problems."

For the time being, business has advanced slowly, but Auvinen believes in the future. Consultation is always needed: if relations between the super powers improve, trade will increase; if developments are to the contrary, the paragraph jungle becomes thicker.

"Finnish firms consider it a matter of honor that no ambiguities have arisen. On the other hand, we are always subject to suspicion since we are involved in this matter," says Auvinen.

"In Finland we know how to be more American than the Americans themselves. When I offered consulting assistance to a certain director, he said to me that 'don't you know there is an embargo'. It is no longer a complete embargo. One can export if one has permission."

Permission is needed since even in automatic telephone exchanges manufactured in Finland there inevitably are American parts.

And permits are not just needed for exports to the Soviet Union. Even though a computer may be intended exclusively for Finnish use, permission from the U.S. Commerce Department must be obtained in order to import it.

"The work requires negotiations on two fronts. The clients are in Moscow. Permission comes from Washington. One must always go to the embassy on Kaivopuisto," says Auvinen in explaining the nature of his work.

Because of present conditions, the interest of Finnish exporters is directed toward the less demanding end of computer equipment: computer housings and furnishings, so-called peripherals such as printers and office automation as well as the application of Finnish automated telephone exchange systems.

During the complete embargo resulting from the declaration of martial law in Poland, Finnish firms even had to request permission for shipping word processors to their own Moscow offices. As far as is known, the answer was that do not ask us and we will not ask you.

The large exporters operating by their own means in trade with the East such as Nokia and the shipbuilders, Wartsila, Rauma-Repola, and Valmet are presently learning so-called productive cooperation. When American electronics cannot be used, Finnish-Soviet equipment is made together instead. Everyone is satisfied.

A Half-Meter Document

"Here is the book," says U.S. Embassy Commercial Attache Max J. Ollendorf and lifts a half-meter thick collection of export regulations onto his desk. "A simple document, it is no mystery," assures Ollendorf.

The export control system is in itself simple, the content of the document, on the contrary, is not.

A Finn intending to enter into computer transactions from the United States must first obtain a certificate from the licensing office, an assurance is given that the equipment will remain in Finland. After that, one can obtain from Ollendorf a form entitled ITA 629, which is filled out and sent to the United States.

If the intent is to re-export to the Soviet Union, a form ITA 699B is needed.

"No permit at all is needed for Atari (a so-called video game). A license must be obtained for larger equipment. Decisions are made on a case-by-case basis and there is no guarantee on the final result. If it is a question of a large computer, forget the whole thing. Do not even ask," advises Ollendorf.

How do U.S. officials know that the regulations will not be broken?

The reporter sitting near the wall shakes his head and Ollendorf says: "Honestly -- I do not know." One can learn quite a bit from mere customs statistics.

Ollendorf, however, gives much credit to Finnish firms. There have been no violations. Smaller firms come to the embassy to ask advice and larger firms order the whole book.

"One-hundred eighteen dollars. Mastercard and Visa are acceptable," says Ollendorf.

However, an engineer is needed to clarify the contents of the book.

"The typical situation is that someone will call and say that he has an American part X in some piece of equipment -- can the item be exported to Czechoslovakia? I cannot answer such questions. The experts who know are in Washington at the Department of Commerce."

And if one makes a mistake, one can end up in another book.

Ollendorf gets down from his bookshelf the listing of "Denial Orders", which angered the Swedes. "This is also a public document, which can be purchased," says Ollendorf and opens the book. The pages are turned to the letter S and one can see that there are long rows of businessmen from Sweden as well as Switzerland on the black list.

There are no Finns on the list.

"The purpose of the list is to protect American firms from conducting business with bad apples. The American exporter is subject to possible penalties," explains Ollendorf.

"If the exported article is completely Finnish, it does not concern us at all."

But if the article is a part of high technology, the direction in which even the emphasis of Finland's exports should gradually be changed?

Fateful Consequences

"In Finland self-control is better than in Sweden," says Economist Harri Luukkanen, who has reported on high-tech foreign trade to the Trade and Industry Ministry.

"The consequence for those who are caught would be fateful. The fine for the seller is either 1 million dollars or five times the amount of the transaction. The worst that can happen to the buyer is an interruption in deliveries. Large corporations in Central Europe have hurried to pay off their fines," explains Luukkanen.

Neutral Finland cannot, of course, be included in any trade blockades directed against the Soviet Union. But it is a different matter if a firm obtains an incorrect import certificate from the licensing office, it can be accused of deceiving officials.

The sensitivity of the matter is demonstrated by the conclusion of the study:

"The undelayed obtainment of high-tech components in Finland is predicated on good trade contacts and confidence at the corporation as well as government level. An example of this is electronic microcircuits and processors, the interrupted obtainment of which would stop the major portion of the domestic production and exporting of high-tech equipment."

Another question is that trade with the East cannot remain limited only to the sales of mass-production goods.

According to Auvinen, who has made many business trips to Moscow, "computer equipment is becoming an important area of trade between Finland and the Soviet Union. Finnish firms must take advantage of their own position themselves since the Finnish share of high-tech trade in the Soviet Union will not be very large when trade returns to normal..."

The demand would be there. The spring sales exhibit of small Finnish firms represented by Auvinen in Moscow was noted on the front page of PRAVDA, which is quite an achievement.

A fantasy tempting even the large firms could, for example, be the transfer of Soviet banks into today's world or the delivery of telephone exchanges.

Thus a test of skills. At the height of technology, between East and West.

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